RESEARCH

MANITOBA
DEPARTMENT OF EDUCATION

EVALUATION OF THE MANITOBA

HIGH SCHOOL COMPUTER NETWORK

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EVALUATION OF THE MANITOBA

HIGH SCHOOL COMPUTER NETWORK

Authorized for release by the
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I. INTRODUCTION

The study arose out of a need identified by the Program Development and Support Division of the Department of Education for information to serve as the basis for a decision on the future of the Manitoba High School Computer Network. The present contract with the supplier of computing services to the Network will expire in 1982 and a decision must be made prior to the preparation of the Departmental Budget for the 1981/82 fiscal year. The study was to include an assessment of the existing situation as well as to provide some options for consideration by Departmental management.

The Manitoba High School Computer Network (Network) began in September 1973 with 23 batch terminals located in 23 different schools. In 1977 a five-year contract was entered into between the Department of Education and Cybershare Ltd. for the provision of computer services to a maximum of 40 schools. During the 1979/80 school year, 36 schools participated directly in the Network while others participated indirectly by using terminals in Network schools or by sending student programs to the Department of Education for processing.

At the time the Network was established the main purposes of the program were set out as follows:

1) "to teach computer science and data processing courses;
2) to provide supportive services which will facilitate improvement in efficiency of operation and level of educational performance by students; and
3) to provide in-school administrative services."[1]

The objectives or main purposes have not been changed to date.

The report has been organized to correspond with the objectives of the program. The initial section "Summary of Findings" provides the operational

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[1] Source - memo distributed by P.M. Luba to Senior Staff March 9, 1973.

definitions used in the study, the highlights by section, and the conclusions and implications. The organization of the report is as follows:

I. To determine the degree to which the High School Computer Network achieves its objective of: "Providing School Administrative Services".

IIA. To determine the degree to which the High School Computer Network achieves its objective of: "Supporting the teaching of Computer Science and Data Processing courses in the high school".

IIB. To determine the educational and manpower outcomes of the Computer Science and Data Processing programs.

III. To determine the degree to which the High School Computer Network achieves its objective of: "Providing support to other school services, especially those services which will help improve the efficiency of school operation and student performance," with respect to: Program Library Users Manual.

IV. To determine the degree to which the High School Computer Network achieves its objective of: "Providing support to other school services, especially those services which will help improve the efficiency of school operation and student performance," with respect to: Computer Assisted Learning Project.

V. To identify and report on alternatives which can provide computer services to schools.

II. SUMMARY OF FINDINGS

A. Operational Definitions

CHOICES: An interactive system developed by the Canadian Employment and Immigration Commission which has computer accessible career guidance information.

Computer Assisted Learning and Computer Assisted Instruction: When used in lower case both refer to any learning a student achieves with the aid of a computer.

Computer Assisted Learning Project (CAL): Specifically refers to the project for special needs students under the direction of Dr. Lauran Sandals of the Faculty of Education, University of Manitoba.

Contact Time: Contact time refers to the period of time during which a student works directly with the computer.

Feeder School: A school which participates in the Network by processing student computer programs through a Network school or the Department of Education, Computer Services Branch.

Network School: A school which participates in the High School Computer Network and has a batch terminal connected via a dedicated line to Cybershare.

Parent/Guardian: For purposes of this report "parent" will be used to refer to the parent/guardian group.

Resource/Remedial Students: In this report the terms "resource" and "remedial" are used interchangeably to describe students who require extra assistance in any area of skill development.

Special Needs Students: For purposes of this report special needs students are defined as any students requiring special assistance outside the regular classroom. This includes physically, mentally, and multiple handicapped students, deaf students, ESL (English Second Language) students, as well as resource/remedial students.

SRU's: System Resource Units are the measure used by Cybershare to indicate the consumption of computer resources.

Teaching Category: For the PLUM evaluation component of the study, teachers, who according to the Subject-Class-Size Data file taught more than one subject, were asked questions referring to the subject they spent the majority of their time teaching ie. "teaching category".

Value of SRU's: The value of SRU's is the product of the number of System Resource Units and the cost per unit as quoted by Cybershare through the Computer Services Consultant.

B. Highlights

SECTION I: Administrative Services

- Among the 46 schools responding, 17 or 50% of the 34 that used a computer facility to perform administrative services, used the Network Administrative Services Package.

- Of the 17 schools which used the Network Administrative Package, 15 used the service for student scheduling, 11 for grade reporting and 10 for cumulative records.

- Schools using the Network Administrative Services Package were generally satisfied.

- Among the reasons cited for using the Administrative Services Package, "more economical" ranked 5th.

- The Network lost one school but gained 11 from other methods or suppliers, with the most common reason for the gains being the Network was more convenient.

- Of the 24 schools reporting that some additional computer-based administrative services were desirable, more than half wanted attendance reporting while one-quarter expressed interest in CHOICES.

- Per pupil unit costs for schools using student scheduling, grade reporting and cumulative record functions on the Network ranged from a low of $7.08 to a high of $26.38. These costs include computer time, materials and a Network overhead allocation.

SECTION II(A): Computer Science and Data Processing Course Support

- Eighty-nine percent of students enrolled in Computer Science 205 and 81% of those enrolled in Computer Science 305 have their programs processed through the Network.

- Eleven Network schools (31%) supplement the Network with a micro computer.

- The popularity of Computer Science and Data Processing courses varies from a low of 3% of the grade X to XII enrolment to a high of 49% of the grade X to XII enrolment.

- The Network schools most often teach Fortran in Computer Science 205 and 305 while Non-Network schools teach Basic.

- One quarter of the Network schools (9) had an introductory 10X level computer related course which involved 381 one credit student equivalents while one Non-Network school had 100 one credit student equivalents in an introductory 10X level course.

- Ninety-five percent of teachers from Network schools indicated that they were "somewhat satisfied" or "very satisfied" when asked to comment on "the suitability of the Network to my needs".

- Some teachers were critical of the cost of Network participation with 19% indicating that they were "somewhat" or "very dissatisfied" with the cost.

- Ninety-one percent of the teachers indicated that they were "somewhat" or "very satisfied" with the Computer Services Branch.

- Using total cost as the basis for determining per pupil cost, the cost varied from a low of $96.44 per pupil enrolled in a Computer Science or Data Processing course to $677.62 per pupil.

- Using the pro-rated Computer Science/Data Processing cost as the basis for determining per pupil cost a range of $60.20 per pupil to $529.83 per pupil was produced.

- Using the value of Department of Education support as the basis for determining per pupil cost produced a range of $52.85 per pupil to $388.10 per pupil for students enrolled in Computer Science and Data Processing courses.

SECTION II(B): Computer Science/Data Processing Student Outcomes

- Sixty percent of the students who took Computer Science 205 and 70% of those who took Data Processing 202 did not take subsequent courses.

- The main reason why students did not take a subsequent course was that they were not interested; the fact that the Computer Science and Data Processing courses are not university entrance courses ranked as the seventh reason for not taking a subsequent course.

- Two hundred and seventy-four students had taken further training since leaving high school (apprenticeship, community college, university, private business school). Of these, 133 students indicated they had taken further computer science/data processing courses.

- Students who took further study in computer science/data processing indicated that their high school courses prepared them "to some extent" or "to a great extent" for this further study.

- Two hundred and sixty-six students were employed full-time. The largest occupational category was clerical (45%), typing, stenography and related occupations.

- Thirty-nine of the 266 respondents indicated they were employed full-time in a job related to their computer science/data processing course.

- Of these 39 students, 9 came from a Non-Network school.

- Of these 39 students, 19 had attended a post-secondary institution, with the majority of these students attending Red River Community College and enrolling in the Computer Analyst Programmer course.

- Basic was the main computer language used on the job by those students who had a computer science/data processing related job. Cobol and Fortran were used the least.

- Fortran was the main language taught in high school.

- Respondents showed more dissatisfaction with those aspects of their course that were equipment related - i.e. availability and reliability of equipment and the type of equipment used in the course.

SECTION III: Program Library User's Manual (PLUM)

- Sixty-two percent of the teachers responding were not aware of PLUM.

- Less than 20% of the 872 teachers responding had utilized PLUM.

- Ninety-five percent (150) of the teachers using PLUM stated that it had served their purpose "moderately" or "very well."

- PLUM was most often used to "motivate students", not to provide supplemental material.

- Ninety-four percent (139) of the users felt PLUM should continue in its present form.

- Forty-one percent (52) of PLUM users would make changes to PLUM. The most often stated change (35 teachers) would take the form of "introducing more PLUM programs."

SECTION IV: Computer Assisted Learning (CAL) Project for Special Needs Children and Adolescents

1. Limitations:

When considering the findings of this section it is important to note the following limitations:[1]

- As a result of time constraints it was not possible to provide comparisons of student performance between CAL Project students and non-CAL students. Therefore, this study focuses on teacher and parent/guardian attitudes and perceptions of computer assisted learning.

[1]For a more detailed discussion of these limitations see: III Results and Observations, Section IV Computer Assisted Learning (CAL) Project, pp.79,81.

- Owing to the diversity of students' abilities and handicaps, a single instrument to measure student attitudes could not be constructed. A variety of instruments would have introduced problems concerning a lack of comparable data. Therefore, parents were questioned as to their child's attitude towards working with the computer.

- Parents/guardians of adolescents at the Manitoba Youth Centre were excluded from the sample, owing to problems involved with releasing adolescents' names and addresses. It was felt that this omission would not adversely affect the outcomes of the study.

2. Highlights:

- The time that students participating in the CAL Project used the computer per five day calendar week ranged from 10 minutes to 140 minutes per week.

- The total cost to operate the CAL Project approximates $44,110 per year. This averages to $4411 for each of the ten participating schools.

- Approximately one-third of the teachers sampled stated they did not receive assistance from "University of Manitoba personnel (i.e. Research Assistant(s), CAL Supervisor, CAL Co-ordinator)", despite the fact that each school was assigned a Research Assistant.

- A positive relationship existed between the increase in the amount of student contact time and teacher perceptions of effectiveness. Teachers who believed their students needed more contact time would like to see minimum weekly contact time in the range of 20 to 100 minutes per student.

- In two schools where teachers felt more weekly per student contact time was necessary, a shortage of hardware did not appear to be the major influencing factor. The perceived shortage of student contact time seemed to be the result of other factors present in the school situation.

- Concerning the primary use of the computer, 75% of teachers indicated that "primarily" they used the computer to"drill students on skills already taught."

- Teachers most often cited "provides individualized instruction" as being the one of the three most important aspects of the CAL Project.

- Seventy-eight percent of teachers stated they encountered recurring problems in the mechanics or operation of the computer. Specifically, "work interruptions often occur" and "logging on takes too long" were regarded as the number one and two problems respectively.

- Overall, 60% of teachers felt the computer was "somewhat effective" as a teaching tool. Teachers who had experienced some type of specialized training were most likely to regard it as "very effective."

- Eighty-four percent of parents knew their child worked with a computer at school.

- Of the parents who were aware their child worked with a computer, 84% had first learned of this from their child.

- Seventy percent of parents indicated their child's school work had improved, while 36% perceived an attitudinal change.

- When all parents were asked "Do you think students benefit from using a computer", 56% replied "yes". However, a sizeable percentage (41%) responded that they did not know.

- The answer given most frequently by those parents who explained why they felt students benefited from using a computer was "helps students to better understand subjects/improves their skills".

SECTION V:

- Dakota Collegiate offered Computer Science and Data Processing courses to 76 students using one micro computer.

- Lord Selkirk Comprehensive School operated a stand-alone system to support Computer Science and Data Processing courses and to perform scheduling and grade reporting.

- Pierre Radisson Collegiate initiated a vocational Data Processing program supported by ten micro computers.

- Opasquia Elementary School in The Pas participated in the CAL project using a Radio Shack TRS-80.

- MECC has moved towards the support of instruction using APPLE II micro computers.

C. CONCLUSIONS/IMPLICATIONS

It was concluded that the Network achieved its objective of: "Providing School Administrative Services" on an overall basis. However, the following implications surfaced:

1. Is the service cost-effective, given:

   (a) The decision of a Winnipeg school division to operate its own system;
   (b) The decision of another Winnipeg school division to contract for the services;
   (c) The reported prices from Manitoba Educational Services?

2. Is there a rationale for Departmental subsidy to this service, given the availability of alternatives i.e. Winnipeg School Division, Manitoba Educational Services, in-house systems?

   (a) Options exist if there is no strong rationale for Departmental subsidy to the Administrative Services Package:
      (i) Price the package and use of Network resources at full cost recovery;
      (ii) Encourage present users to consider Winnipeg S.D. or other suppliers;
      (iii) Allow Cybershare or another service bureau to market the package.

   (b) Options exist if there is a strong rationale for Departmental subsidy:
      (i) Continue the existing arrangement and provide support to non-users;
      (ii) Provide grants on a per pupil basis for administrative functions;
      (iii) Develop, distribute, and support software for in-house installations.

The following factors should be considered in reaching a decision:

1. The objective and rationale
2. Costs and efficiency measures
3. Equity
4. Satisfaction of current users

It was concluded that generally the Network achieved its objective of "Supporting the teaching of Computer Science and Data Processing courses in the high school." However, the following implications surfaced:

1. Not all students taking Computer Science/Data Processing courses received support from the Network; some schools may not teach these courses because the support is not available.

2. Is the objective of teaching Computer Science/Data Processing courses to promote computer literacy/awareness or to teach job entry level (vocational) programming skills?

   (a) A vocational program exists in Manitoba which does not use the Network.
   (b) In other jurisdictions programming is taught as a vocational program involving a variety of hardware configurations.
   (c) In other jurisdictions general education with respect to computers involves integration of computers into other subject areas as a support to instruction.
   (d) How much "computer power" is necessary to support the teaching of awareness/literacy level computer education?

3. Is the service cost-effective, given the range of cost per pupil?

   The actual cost effectiveness can only be determined if the objectives of the programs are clearly specified.

The following factors should be considered in reaching a decision:

1. What is the target population for computer education?
2. What should be the objectives of computer education?
3. What is the most cost-effective means of achieving the objectives?
4. The state of the art with respect to programs and hardware as illustrated by the alternatives presented.

It was concluded that students generally did not take a full sequence of either Computer Science or Data Processing courses. Furthermore, it was concluded that training in these courses did not lead to placement in a computer-related occupation. However, the following implications surfaced:

1. If the objective of the program is to have students complete a sequence in either Computer Science or Data Processing, then the objective has not been met.

2. If the objective of the program is to provide exposure to students then:

   (a) The objective has not been met because of the low participation rate;
   (b) The program does not demonstrate cost-effectiveness on an overall basis.

3. If the objective of the program is vocational in nature, then the objective has not been met and cost-effectiveness cannot be demonstrated on the basis of the small number of graduates who attain computer related occupations.

The following factors should be considered in reaching a decision:

1. What is the target population of computer education?
2. What is the objective of computer education?
3. The reasons given by students for non-continuation in a sequence.
4. Program alternatives in existence here and in other jurisdictions.

It was concluded that the Network did not achieve its objective of: "Providing support to other school services, especially those services which will help improve the efficiency of school operation and student performance" as measured by PLUM's performance in meeting its specific objectives. The following implications surfaced:

1. If it is to meet its potential of reaching 100% of students in Network schools then:

   (a) Teacher awareness will have to be increased beyond current levels;
   (b) Programs will have to be made available in all subjects.

2. Given the resources expended and the number of users, alternatives may have to be explored to improve the cost-effectiveness.

The following factors should be considered in reaching a decision:

1. A review of the objective in terms of scope and degree.
2. The existing situation in schools with respect to the use and availability of micro computers.

3. The concept of a soft versus a hard Network.
4. The state of the art in other jurisdictions.

It was concluded that the Network achieved its objective of: "Providing support to other school services, especially those services which will help improve the efficiency of school operation and student performance" as measured by the performance of CAL in meeting its special goals. The following implications surfaced:

If the Network is limited to secondary schools and as the majority of students participating in CAL are elementary students, then the objective has not been met.

Notwithstanding the above:

1. The CAL Project could be continued independent of the Network.

2. Micro computers are a viable alternative to the Network as evidenced by the recent expansion of the CAL Project using a micro computer.

3. As no measures of output exist, other than perceptions of those involved, a firm cost-effectiveness measure cannot be established.

4. The lack of leadership and participation in CAL by the Department of Education.

The following factors should be considered in reaching a decision:

1. The role of the Department of Education in CAL.
2. The target population of CAL.
3. Cost of expansion and cost-effectiveness of the program.
4. The state of the art.

It was concluded that alternatives beyond the Network are possible and viable.

The following factors should be considered in reaching any decisions:

1. Current alternatives were not generally available in 1973.
2. The Department was the leader in computer education in 1973. Currently, a number of schools are embarking on new programs and are acquiring new hardware on their own.
3. What is the need for computer education in the 80's and 90's?
4. What is the role of the Department of Education?
5. What is the impact of the micro-explosion?
   i.e. How many different makes can/should the Department of Education support?
6. Can the Network be soft rather than hard?
7. What are the needs in schools?
   i.e. PAB

Given the new technology, a software Network might provide a more cost-effective means of providing schools with:

C.A.I./CAL
PLUM
Administrative Services
Computer Education
CHOICES

In conclusion, when determining a future course of action for computer education, the following must be considered in terms of an overall objective:

WHAT is to be provided? WHY?

to WHOM it is to be provided?

at WHAT COST it is to be provided?

and lastly - HOW it is to be provided?

III. RESULTS AND OBSERVATIONS

SECTION I

ADMINISTRATIVE SERVICES

I. INTRODUCTION

(A) Objective

The objective of this section is to determine the degree to which the High School Computer Network (Network) achieves its objective of: "Providing School Administrative Services".

(B) Background

The Administrative Services Package made available through the Network contains components which support two distinct functions, student scheduling and grade reporting. The latter also provides the capability of maintaining pupil cumulative record files.

Seventeen schools have used one or both components of the Administrative Services Package during the 1979-80 school year.

II. METHODOLOGY

(A) Questionnaire Design

A survey instrument was designed for administration to school principals. The instrument was developed by members of the Research Branch in consultation with the Computer Science Consultant and selected principals. The items contained in the questionnaires reflected the objective that was previously outlined. A copy of the instrument may be found in Appendix A.

(B) Sample Selection/Field Methods

The questionnaire was either delivered or mailed to all principals of schools which participated in the Network as well as principals of

schools offering Computer Science or Data Processing courses. This resulted in a sample of 48 schools of which 36 were Network schools. Where possible, members of the Research Branch reviewed the questionnaire with the principal then left it for completion.[1] The principals were asked to mail the questionnaire to the Research Branch in a self-addressed envelope. Table I-1 provides an indication of the overall response rate for principals. After follow-up telephone calls, questionnaires were received for all Network schools and all but two other schools.

TABLE I-1

RESPONSE RATE FOR PRINCIPAL QUESTIONNAIRE

Type of School	Questionnaires Sent (N)	Returned (N)	Response Rate (%)
Network	36	36	100%
Feeder	6	6	100%
Other	6	4	67%
Total	48	46	96%

III. RESULTS AND DISCUSSION OF FINDINGS

(A) Use of the Network Administrative Services Package

As shown in Table I-2, forty of the schools replied that they participated in the Network. Of this specific group, 32 (80%) indicated that they were aware of the Administrative Services Package available on the Network and, in turn, 17 indicated that they used the Network to provide at least one of the administrative services available.

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[1] Evaluation packages were mailed to six of the 48 schools surveyed. The remaining 42 schools had in-person interviews conducted by members of the Research Branch

Of the 46 schools responding, 34 indicated that a computer facility was used for administrative services. Of these, 17 (50%) used the Network Administrative Services Package. (Table I-2).

TABLE I-2

NUMBER OF SCHOOLS BY SCHOOL TYPE INDICATING PARTICIPATION IN THE NETWORK, AWARENESS OF THE NETWORK ADMINISTRATIVE SERVICES PACKAGE, AND USE OF A COMPUTER FOR PERFORMING ANY ADMINISTRATIVE FUNCTION

Type of School	Participate in Network		Aware of Network Administrative Services Package		Use a Computer for Administrative Function			
					On Network		Other	
	Yes (N)	No (N)	Yes (N)	No (N)	Yes (N)	No (N)	Yes (N)	No (N)
Network	36	0	30	6	17	19	14	22
Feeder	4	2	3	3	0	6	1	5
Other	0	4	2	2	0	4	2	2
Total	40	6	35	11	17	29	17	29

(B) Use of Computer Facilities for Administrative Functions

Thirty-four schools reported using a computer or data processing service in performing administrative functions. Of these, 31 (91%) used student scheduling, 27 (79%) used grade reporting and 23 (68%) used cumulative records.

Of the 17 schools which used the Network Administrative Package, 15 used the service for student scheduling, 11 for grade reporting and 10 for cumulative records (Table I-3).

TABLE I-3

ADMINISTRATIVE FUNCTIONS BY NETWORK AND OTHER SUPPLIERS

Administrative Function	Schools Using Network (N)	Schools Using Network (%)	Schools Using Other Suppliers (N)	Schools Using Other Suppliers (%)	Number of Schools (N)
Student Scheduling	15	48%	16	52%	31
Grade Reporting	11	41%	16	59%	27
Cumulative Records	10	43%	13	57%	23

(C) Satisfaction With the Network Administrative Services Package

Users of the Network Administrative Services Package were generally satisfied as shown in Table I-4.

TABLE I-4

SATISFACTION WITH NETWORK ADMINISTRATIVE SERVICES PACKAGE

Service	Very Satisfactory (N)	Satisfactory (N)	Not Satisfactory (N)	Number of Schools (N)
Student Scheduling	12	2	1	15
Grade Reporting	7	2	2	11
Cumulative Records	3	5	2	10

The reason given for dissatisfaction with student scheduling was the difficulty of making changes to time tables in a batch system.

Grade reporting was viewed as taking "too much time" as well as being time-consuming to print, given the terminals in the school. Cumulative

records were viewed as costly to maintain and, as well, the batch system does not allow inquiries on individual student cumulative records (Question 5b).

All of the schools indicated satisfaction with the manuals available to assist users with the Network Administrative Services Package.

(D) Reasons for Using the Network Administrative Services Package

Of the 17 schools using the Network Administrative Services Package the reason most frequently cited was "locally operated". A number of schools (12) also indicated that the package was "better suited to my needs" as shown in Table I-5.

TABLE I-5

REASONS FOR USING THE NETWORK ADMINISTRATIVE SERVICES PACKAGE

Reason	Number of Responses*
Locally operated	14
Better suited to my needs	12
More flexible	11
Easier to use	9
More economical	8
Other**	3

*Schools were allowed to cite more than one reason.
**The other category includes "readily available", "no other source for school-oriented services" and "great confidence in Duncan McCaig".

(E) Reasons for Not Using the Network Administrative Services Package

Eight schools reported that the Network Administrative Services Package was not used because the Division had an in-house system. Seven schools indicated that the Network Administrative Services Package was "too expensive" while an equal number stated that "insufficient staff resources to run package" prevented their use (Table I-6).

TABLE I-6

REASONS FOR NOT USING THE NETWORK ADMINISTRATIVE SERVICES PACKAGE

Reason	Number of Responses*
Own system	8
Too expensive	7
Insufficient staff resources to run package	7
Enrolment not large enough	6
Not on network	6
Not flexible enough	2
School division policy	2
Turn around time not as good as M.E.S.	2
Have not obtained Board approval	2
Other**	3

*Schools were allowed to cite more than one reason.
**Other includes "leaving too much work", "not aware of it" and "slow access to files".

(F) Previously Used Services

Of the 46 schools responding, 21 schools indicated that they had used an alternative method of performing an administrative function or functions. Twenty of the 21 were Network schools. Nineteen of the 21 had used a computer or data processing service to perform some administrative function (Question 3).

In 18 out of 21 cases, schools reported that they switched either methods or suppliers of student scheduling services. The Network lost one school to other methods or suppliers and gained 11 schools from other methods or suppliers. Of those gained, the Network acquired six clients from Manitoba Educational Services (M.E.S.).

The most common reason for having changed to the Network was that the Network was more convenient. Table I-7 provides reasons for changing.

TABLE I-7

REASONS FOR CHANGING METHODS OR SUPPLIERS
OF AN ADMINISTRATIVE SERVICE

Reason Given for Change	Change to Network (N)	Change to* Other (N)
Network more convenient	6	-
Too many problems	2	3
Package not suitable	2	1
Costs too high	-	2
In house system	-	2
Firm went out of business	-	1
More efficient on a manual basis	-	1
No comment	-	1

*Each school was allowed to cite more than one reason.

(G) Time Expended by School Personnel to Use the Administrative Services Package

Because the Administrative Services Package requires the active participation of school personnel, data was collected on the estimated hours that school personnel devoted to this function. Table I-8 presents the average hours by type of employee as well as the ranges for the 17 schools responding.

In the data returned, seven schools (41%) reported that principals spent no time in attending to the computer-related administrative services. The same number indicated that their other administrative staff spent no time in such endeavours. No time was reported in only three schools (18%) and two schools (12%) respectively for clerical staff and teachers in the school (Question 5c). (Table I-8).

TABLE I-8

ANNUAL HOURS REPORTED FOR SCHOOL PERSONNEL
IN USING ADMINISTRATIVE SERVICES

Employee Category	Number of Schools That Reported Time In This Staff Category	Range of Hours	Average Number of Hours
Principal	10	0-300	51
Other Administrative Staff	10	0-250	61
School Clerical	14	0-560	140
Teachers in School	15	0-1000	220

(H) Additional Computer-Based Administrative Services Wanted

Of the 46 schools responding, 24 indicated that some additional computer-based administrative services were desirable. The Administrative Services desired are shown in Table I-9.

TABLE I-9

ADDITIONAL ADMINISTRATIVE SERVICES WANTED

Administrative Services Wanted	Number of Requests*
Attendance recording and reporting	13
Budget and financial statements	10
Vocational-Industrial/Business Education Grant Reporting	9
"CHOICES"	6
Inventory System	5
Other**	6

*A school was allowed to indicate a desire for more than one Administrative Service.

**Other category includes "upload data from micros", "locker lists", "time tabling", "maintenance records", "grade reporting" and "library loan records".

(I) Costs

Using a model, costs have been developed for the Administrative Services Package available through the Network. Costs have been developed on four bases.

The first basis included the costs of computer time and materials. This did not include any allocation of the Network fixed costs but dealt only with the extra expenses incurred in using the Administrative Services Package. The cost of using scheduling, grade reporting, and cumulative records ranged from a low of $2.74 per pupil to a high of $10.04 per pupil. Scheduling costs ranged from $2.18 per pupil to $4.61. Grade reporting done at two schools, ranged from $5.16 per pupil to $9.45 per pupil.

The second basis of cost calculation included the costs of computer time, materials and an allocation to cover the proportionate share of Network fixed costs. On this basis the cost of scheduling, grade reporting, and cumulative records ranged from $7.08 per pupil to $26.38 per pupil. Similarly, the cost of scheduling ranged from $5.49 per pupil to $15.61. Also, grade reporting ranged from $12.62 per pupil to $14.59.

The third basis of cost calculation included the costs of computer time, materials, allocation for Network fixed costs, and a cost figure for staff time of principals, other administrative staff, and clerical staff. The cost of scheduling, grade reporting, and cumulative records ranges from $9.00 per pupil to $30.51 per pupil. Similarly, the cost of scheduling ranged from $7.74 per pupil to $29.41. The cost of grade reporting ranged from $13.97 per pupil to $17.26.

The fourth basis included all costs found in the third basis and added a cost value for time of teachers involved. Consequently, the costs for scheduling, grade reporting, and cumulative records ranged from a low of $9.23 per pupil to $32.01 per pupil. The cost of scheduling varied between

$8.05 per pupil to $29.41 per pupil. Similarly the cost of grade reporting was $18.25 per pupil to $19.65.

Costs for contracted services of scheduling, grade reporting, and cumulative records averaged approximately $6.00 per pupil. As some effort was expended by school staff in preparing input, a comparable cost would have been somewhere between the cost as computed on basis 2 and the cost as computed on basis 3. Similar comparisons could be made for schools using only one of the three administrative services available.

IV. GENERAL OBSERVATIONS

1. A Winnipeg school division, through its in-house computer system, has the Network scheduling package which it makes available to other Divisions at a cost of $2.10 per pupil. The Division is presently negotiating for the Network grade reporting system. One School Division indicated that the 1979/80 rates being charged by Manitoba Educational Services were $3.00 per pupil for scheduling and $3.60 per pupil for grade reporting. It was observed that these rates are, in most cases, as low or lower than those incurred by schools using the Network Administrative Package.

2. The following factors may account for variations in cost from school to school:

   Basis 1 - Skill of those using the package and the degree to which data preparation is contracted out.

   Basis 2 - Proportion of terminal use attributable to administrative services, and the distance from Winnipeg.

   Basis 3 - Time expended by school personnel (not including teachers) in using the package.

   Basis 4 - Time expended by teachers* in using the package.

3. A number of principals indicated that the Administrative Services Package was the most important feature of the Network.

4. There was a need expressed for more in-service support from the Department.

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* Inclusion of teacher time as a cost may be inappropriate as their involvement might be required under any system.

SECTION II (A)
COMPUTER SCIENCE AND DATA PROCESSING COURSE SUPPORT

I. INTRODUCTION

(A) Objective

The objective of this section is to determine the degree to which the High School Computer Network achieved its objective of: "Supporting the teaching of Computer Science and Data Processing courses in the high school."

Specifically, the objectives were to:

- determine the scope of teaching of Computer Science and Data Processing in high school including Departmental courses, school initiated courses, student initiated programs, and pilot programs;
- determine the methods employed by schools involved in the teaching of Computer Science and Data Processing courses to process student programs;
- determine and report on the content of courses with respect to languages taught in Computer Science and Data Processing that might impact the nature of equipment and processing facilities required for their support;
- assess the satisfaction of the teachers involved in the teaching of Computer Science and Data Processing with various aspects of the High School Computer Network; and,
- determine the costs per pupil on a school by school basis for the resources expended in supporting the teaching of Computer Science and Data Processing.

(B) Background

The High School Computer Network began in September of 1973 and consisted of batch terminals in twenty-three schools in Manitoba. During the 1979/80 school year, thirty-six schools participated directly in the Network while others participated indirectly by using terminals in schools that were connected or by sending student programs to the Department of Education for processing. In 1977 a five year contract was entered into between the Department of Education and Cybershare Ltd. for the provision of computer services to a maximum of forty schools.

The Network consists of thirty-six batch terminals connected via dedicated telephone lines to a central computer located in Winnipeg. An extension of this service allows other schools to process computer programs at either a school with a terminal or at the Department of Education located in Winnipeg. Six schools have elected to utilize the second option. In addition, the Department of Education provides support services through a Computer Services Consultant and an Administrative Secretary. Two STEP Students are assigned annually to update and edit computer programs and software used by schools participating in the Network.

II. METHODOLOGY

(A) Questionnaire Design

The survey instrument was designed for administration to teachers of Computer Science and/or Data Processing. The instrument was developed by members of the Research Branch in consultation with the Computer Science Consultant and selected teachers. The items contained in the questionnaire reflected the objectives that were previously outlined. A copy of the instrument may be found in Appendix B.

(B) Sample Selection/Field Methods

The Subject-Class Size Data file was used to provide a list of teachers who taught Computer Science 205 or 305 or Data Processing 202 or 302 during the 1979/80 school year. A questionnaire was addressed to each of the teachers on this list and forwarded to the teacher through the principal. Table IIA-1 provides an indication of the responses for teachers.

TABLE IIA-1

RESPONSE RATE FOR TEACHER QUESTIONNAIRE

Type of School	Questionnaires		
	Sent (N)	Responses (N)	Rates (%)
Network	66	65	98%
Teacher	4	4	100%
Other	4	4	100%
Total	74	73	99%

TABLE IIA-2

ENROLMENTS IN COMPUTER SCIENCE AND DATA PROCESSING COURSES

	Computer Science		Data Processing	
	205 (N)	305 (N)	202 (N)	302 (N)
Network	1486	276	1063	163
Feeder	22	-	18	-
Other	174	52	98	10
Total	1682	328	1179	173

III. RESULTS AND DISCUSSION OF FINDINGS

(A) Computer Related Courses

Three major components can be identified in the teaching of Computer Science and Data Processing in the high school. These components are: Department of Education courses (Computer Science 205 and 305 and Data Processing 202 and 302), school initiated courses (SIC's) or student initiated programs (SIP's), and a pilot program with a major in Data Processing as part of the Business Education program. Of these components, the teaching of Department of Education courses serves the largest number of students.

The overall enrolments in Computer Science and Data Processing courses are shown in Table IIA-2.

Responses of principals and teachers to the question relating to the processing of student programs may be observed in Table IIA-3. A number of schools that participate in the Network supplement the services available by using a micro or mini computer.

The popularity of Data Processing and Computer Science courses varies from school to school, ranging from a low of 3% of the enrolment to a high of 49% of the enrolment. For schools participating in the Network, enrolment in Data Processing and Computer Science courses accounts for 10% of total (grade X-XII) enrolment on average for urban schools and for 14% of total (grade X-XII) enrolment on average for rural schools.

The Network schools most often teach FORTRAN in Computer Science 205 and 305 while non-Network schools teach BASIC. In Computer Science 305 COBOL shares prominence in Network schools (Table IIA-4).

More similarity may be noted in both Network and non-Network schools that teach Data Processing 202 with respect to the languages and their emphasis. During the 1979/80 school year no data was available for schools not on the Network and teaching Data Processing 302 (Table IIA-5).

Another component of teaching Computer Science and Data Processing courses involves school initiated courses (SIC's) and student initiated programs (SIP's).

TABLE IIA-3

METHODS(S) OF PROCESSING STUDENT JOBS BY SCHOOL

School	Terminal Network	Feeder Network	Micro/ Mini	Terminal To U of M	Mail/Courier To Network	Other
Churchill High	* +		* +			
Crocus Plains Regional	* +					
Daniel McIntyre	* +					
Dauphin Regional	* +					
Elmwood High	* +					
Fort Richmond Collegiate	* +		+			
Garden City Collegiate	* +		+			
Garden Valley Collegiate	* +					
Glenlawn Collegiate	* +					
Goose Lake High	* +		+			
Gordon Bell	* +					
Grant Park High	* +		+			
John Taylor Collegiate	* +					
Kelvin High	* +		* +	* +		
Kildonan East Regional	* +		* +			
Margaret Barbour	* +					
Miles Macdonell	* +					
Murdoch Mackay	* +					
Neelin High	* +					
Neepawa Area Collegiate	* +					
Nelson McIntyre	* +					
Pierre Radisson Comp.	* +		* +			
R.D. Parker Collegiate	* +					
River East Collegiate	* +					
Sisler High	* +					
St. James Collegiate	* +					
St. John's High	* +		* +			
Steinbach Regional	* +					
Sturgeon Creek Regional	* +					
Swan Valley Regional	* +					
Tech-Vocational	* +					
Transcona Collegiate	* +		* +			
Vincent Massey Collegiate	* +					
Virden Collegiate	* +					
West Kildonan Collegiate	* +		* +			
Westwood Collegiate	* +					
Easton		*				
Gilbert Plains		* +				
Windsor Park		* +				
Portage la Prairie S.D.			* +	* +	* +	
St. Mary's Academy				*		
Lord Selkirk Regional			* +			
Dakota Collegiate			*			
Grandview		* +				
Pinawa Secondary						* + = 1
West Lynn Heights						* + = 2

Principal Responses = *

Teacher Responses = +

1 = Atomic Energy of Canada

2 = Sheritt Gordon Mines

TABLE IIA-4

COMPUTER SCIENCE
COURSE CONTENT

School	Course Content: Basic 205 (%)	Basic 305 (%)	Cobol 205 (%)	Cobol 305 (%)	Fortran 205 (%)	Fortran 305 (%)	Assembler 205 (%)	Assembler 305 (%)	Spectre 205 (%)	Spectre 305 (%)	Other 205 (%)	Other 305 (%)
Network	38%	22%	5%	35%	87%	35%	8%	10%	9%	17%	8%	16%
Non-Network	95%	90%	-	30%	78%	18%	-	15%	-	15%	20%	8%
Overall	45%	26%	5%	35%	85%	42%	8%	11%	9%	17%	10%	14%

TABLE IIA-5

DATA PROCESSING
COURSE CONTENT

School	Course Content: Basic 205 (%)	Basic 305 (%)	Cobol 205 (%)	Cobol 305 (%)	Fortran 205 (%)	Fortran 305 (%)	Assembler 205 (%)	Assembler 305 (%)	Spectre 205 (%)	Spectre 305 (%)	Other 205 (%)	Other 305 (%)
Network	40%	45%	32%	70%	69%	21%	2%	2%	18%	-	20%	46%
Non-Network	55%	-	-	-	70%	-	-	-	20%	-	-	-
Overall	43%	45%	32%	70%	69%	21%	2%	2%	19%	-	20%	46%

As part of the data collection process, principals were asked to indicate if "Any computer related courses other than Computer Science 205 and 305 and Data Processing 202 and 302, (including SIC's and SIP's) were available in the school?" Of the 36 schools participating in the Network, 9 responded in the affirmative. Table IIA-6 displays the school name, course level, enrolment, and credit value for these courses.

The third component of teaching Computer Science and/or Data Processing can be described as a Data Processing Major as part of a Business Education program. This approach is in the pilot stage at Pierre Radisson Collegiate and has been in operation for two years. The program does not use or require the High School Computer Network for its operation. This component will be discussed more fully in the section of this report dealing with alternatives (Section V).

ENROLMENT IN COMPUTER RELATED SCHOOL INITIATED COURSES

TABLE IIA-6

School	Enrolment By Course Level			Credit Value		
Network	10 X	20 X	30 X	10 X	20 X	30 X
Crocus Plains Regional	55			1.0		
Elmwood High	40			0.5		
Garden City Collegiate	15			1.0		
Gordon Bell	15			1.0		
Margaret Barbour	50			0.5		
Pierre Radisson Comp.	28	12		1.0	1.0	
Steinbach Regional Sec.	40			1.0		
Vincent Massey Collegiate	65			0.5		
West Kildonan Collegiate	150			1.0		
Non Network						
Lord Selkirk Regional	100			1.0		
Windsor Park		28			0.5	

Source: Principal Questionnaire

(B) TEACHER SATISFACTION

(i) Network Schools

Overall, teachers in schools that participated in the Network were satisfied with the Network and the services available. When asked to comment on "the suitability of the Manitoba High School Network to my needs" 95% of those responding indicated that they were either "somewhat satisfied" or "very satisfied." Teachers were critical of the speed of service available from the Manitoba Telephone System with 12% of those responding they were "somewhat" or "very dissatisfied." Teachers were more critical of the cost of the computer network participation with 19% indicating that they were "somewhat" or "very dissatisfied" with the cost. Four of the respondents, (7%), indicated a degree of dissatisfaction with the support from the Computer Services Branch of the Department of Education. However, two of the respondents qualified their response by indicating that in their opinion the Branch was understaffed or had too few resources. The vast majority, 91%, indicated that they were "somewhat" or "very satisfied" with the Branch (Table IIA-7.)

(ii) Non-Network Schools

While many of the questions were not applicable to respondents who taught in Non-Network schools, teachers indicated general satisfaction with the method used for processing student jobs. Two teachers were dissatisfied with the time required to process student jobs. Both respondents were from Feeder schools (Table IIA-8.)

TABLE 11A-7

TEACHER SATISFACTION WITH VARIOUS ASPECTS OF THE HIGH SCHOOL COMPUTER NETWORK
FOR NETWORK SCHOOLS

Aspects	Satisfaction					
	Very Dissatisfied (%)	Somewhat Dissatisfied (%)	Somewhat Satisfied (%)	Very Satisfied (%)	Not Applicable (%)	Number of Respondents (N)
1. The terminal (cardreader/ printer) in the school		8%	40%	52%		59
2. The terminal (interactive/ teletype) in the school			13%	7%	80%	44
3. The software available to process the student jobs		2%	25%	70%	3%	59
4. The turn around time (amount of time it takes to process a student job		3%	19%	76%	2%	59
5. The cost of the service	3%	14%	42%	25%	15%	52
6. The support needed from the Computer Services Branch, Department of Education	4%	4%	27%	64%	2%	56
7. The support received from Cybershare		5%	46%	38%	11%	56
8. The speed at which I receive service from the Manitoba Telephone System	2%	10%	36%	50%	2%	58
9. The quality of service I receive from the Manitoba Telephone System		12%	38%	48%	2%	58
10. The suitability of the Manitoba High School Computer Network to nee		3%	34%	61%	2%	59

TABLE IIA-8

TEACHER SATISFACTION WITH VARIOUS ASPECTS OF THE HIGH SCHOOL COMPUTER NETWORK
FOR NON-NETWORK SCHOOLS

Aspects	Satisfaction					
	Very Dissatisfied (%)	Somewhat Dissatisfied (%)	Somewhat Satisfied (%)	Very Satisfied (%)	Not Applicable (%)	Number of Respondents (N)
1. The terminal (cardreader/ printer) in the school					38%	3
2. The terminal (interactive/ teletype) in the school					38%	3
3. The software available to process student jobs			25%	13%		3
4. The turn around time (amount of time it takes to process a student job		25%	13%	13%		4
5. The cost of the service			25%	25%		4
6. The support needed from the Computer Services Branch, Department of Education			13%	38%		4
7. The support received from Cybershare			13%	13%	25%	4
8. The speed at which I received service from the Manitoba Telephone System					50%	4
9. The quality of service I receive from the Manitoba Telephone System					50%	4
10. The suitability of the Manitoba High School Computer Network to [illegible] eed	[illegible]		[illegible]%	25%		5

(C) Costs

Through a model, costs have been developed for the teaching of Computer Science and Data Processing courses. The model does not include any instructional salaries or costs associated with the teaching of all courses but deals exclusively with those costs particular to the teaching of computer related courses. The model is based on the premise that the operation of the Network serves three programs and the costs should be allocated to those programs in proportion to the resources each uses. Schools participating in the Network control the degree of use that is made of each of the three programs. Some schools process only student programs while others make extensive use of administrative services. Because of the large proportion of fixed costs associated with the Network greater utilization will lower the costs per unit used.

Based on the methodology, costs per pupil served have been developed on three bases.

The first basis is the cost per pupil served using the total cost. This basis ignores the premise put forth in the model, but is provided so that comparisons with previous studies can be made. On this basis, the cost per pupil (using Department courses) ranges from a low of $96.44 per pupil to a high of $677.62 per pupil.

The second basis is the cost per pupil served based on the cost allocated to the processing of student programs. In this case the costs associated with PLUM usage and the proportion of fixed cost attributable to Administrative Services Package use have been deducted. On this basis the cost per pupil (using Departmental courses) ranges from a low of $60.20 per pupil to a high of $529.83 per pupil. However, one must realize that a cost then is associated with PLUM program usage and the real cost of using the Administrative Services Package is higher.

Another basis of developing a cost per pupil is on the basis of Departmental support to the program. In this case the total contributions by the Department of Education have been decided by the number of students served. On this basis, the cost per pupil ranges from a low of $52.85 to a high of $388.10 per pupil.

The support from the Department varies from school to school and is based on factors such as line costs and SRU's used.

IV. GENERAL OBSERVATIONS

1. During the 1979/80 school year the majority of Computer Science/Data Processing students had their jobs processed through the Network. However, 11% of Computer Science 205 students, 19% of Computer Science 305 students, 9% of Data Prcessing 202 students and 6% of Data Processing 302 students used an alternative for processing their student jobs.

2. For school initiated courses at the 10X level the Network provided computing services to 82% of those enrolled.

3. Basic was used in most cases as the language taught in Computer Science 205 by schools using either a micro or mini computer while schools on the Network generally used Fortran. However, a number of Network schools were teaching Basic in Computer Science 205.

4. Enrollments in Computer Science and Data Processing courses in rural schools generally involved a greater proportion of those students enrolled in grades X to XII than those in urban schools. This may be explained in part by the smaller number of options made available to students in rural schools.

5. The fixed costs, those costs that do not depend on the degree of usage, were higher on a per pupil basis in rural schools and in urban schools with smaller enrollments in Computer Science and Data Processing. In rural schools an additional factor that raised the fixed cost per pupil was the telephone line cost.

6. Overall, a wide variation was noted in the cost of providing services on both a location basis and on a per pupil basis.

SECTION II (B)

COMPUTER SCIENCE/DATA PROCESSING STUDENT OUTCOMES

I. INTRODUCTION

(A) Objective

The objective of this section is to provide educational and manpower outcome information on students having taken at least one computer science or data processing course.

Specifically, the objectives were to:

- Determine which computer science/data processing course(s) were taken;
- Assess reasons why students did not take further computer science/data processing courses in high school after having completed Computer Science 205 and/or Data Processing 202;
- Determine occupational outcomes of students;
- Determine how many students went on to further training and the institutions attended and programs taken;
- Assess whether students have enrolled in other computer science/data processing courses in their post-high school educational activities;
- Assess students' perceptions of the relationship between their job and their high school computer science/data processing course(s);
- Assess the relationship between the computer languages the students learned in high school and the computer languages they are using on the job; and
- Assess the students' satisfaction with various aspects and services (eg. instruction, equipment) of their computer science/data processing course(s).

(B) Background

High school courses are offered in Computer Science at the 205 and 305 levels and in Data Processing at the 202 and 302 levels. As well, a number of introductory and advanced level courses are offered as SICS or SIPS.

The basic objectives[1] of these courses are as follows:

Computer Science 205 and 305 - to provide "a basic understanding of computers in order to appreciate the limitations of a computer as well as its potential for problem solving in a wide variety of areas".

Data Processing 202 - "to provide students with an understanding of the principles and techniques involved in the processing of data in business organizations and an understanding of knowledge of modern techniques of handling information".

Data Processing 302 - "to familiarize the student with the use of the computer in solving business accounting problems and to introduce him to Cobol programming".

II. METHODOLOGY

(A) Questionnaire Design

The questionnaire was developed in consultation with members of the Research Branch. The item content of the questionnaire reflected the objectives of the study as previously outlined.

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1 Province of Manitoba, Department of Education Curriculum Guides.

(B) Sample Selection

The group to be surveyed included those students who had taken at least one computer science or data processing course at a Network high school. A sample of students was also included from Lord Selkirk Regional School which teaches computer science and data processing on its own system. The Student Academic Records System of the Department of Education was used to provide lists of students who had received credit for either Computer Science 205 or Data Processing 202 for the period 1977 to present. These lists formed the basis for the preparation of sample lists.

From the Student Academic Records System, 4261 students were identified. An additional 461 names were provided by Lord Selkirk School Division from their own student records system. Thus 4722 students were identified as the study population. A stratified simple random sample was drawn. The total number of students to be surveyed was 1600. For each school, the number of students who had taken only computer science, only data processing or a combination of both subjects was identified. Each school was then allocated an appropriate number of sample spots, based on the percentage of the total computer science/data processing population. Once the stratification was done the sampling was started. A simple random sampling was done within strata (schools) so that the number of students required in a school was selected from the list for that school.

Student names were then sent to their high school of attendance; schools were asked to supply the last known address for each of the students on their sample list. These lists were then returned to the Research Branch and became the survey sample lists. The final sample was comprised of 1593 students.

(C) Field Methods/Response Rate

Letters introducing the survey, questionnaire and postage-paid return envelopes were mailed to the survey sample during the first week of May, 1980. After approximately two weeks, a reminder card was sent out to those survey participants who had not returned a completed questionnaire.

A total of 755 questionnaires were returned for a response rate of 47%; the number of useable questionnaires was 731 for a response rate of 46%.

III. RESULTS AND DISCUSSION OF FINDINGS

(A) Background Data

Distribution of Sample Respondents by Course

Fifty-six percent of the sample took Computer Science in high school and 32% took Data Processing (Question 1).

TABLE IIB-1

DISTRIBUTION OF SAMPLE RESPONDENTS BY COURSE

Course	Number of Responses	Percentage
Computer Science	411	56%
Data Processing	233	32%
Combination	41	6%
Unclassified*	46	6%
	731	100%

*Respondents whose course pattern could not be identified.

(iii) Gender

There were 363 (51%) males and 354 (49%) females in the sample (Question 2). Males comprised 64% of the computer science sample while females made up 72% of the data processing sample.

(iv) Overall Academic Average In Last Year Of High School

Almost three-quarters of the students sampled stated that their overall academic average was B or better; 27% indicated an A or A+ average. Thirty-two percent of the computer science students indicated an A or A+ academic average compared with 19% of the data processing students. Conversely, 38% of data processing students were more likely to report C or D academic average as compared to 19% of the computer science students (Question 3).

(B) Computer Science/Data Processing Courses Taken

It is evident from Table IIB-2 that a large number of the respondents took only Computer Science 205 or Data Processing 202 and did not take a subsequent course.

TABLE IIB-2

COMPUTER SCIENCE/DATA PROCESSING COURSES TAKEN

Courses	Number of Students*
Computer Science 205	445
Computer Science 305	185
Data Processing 202	287
Data Processing 302	92

*Number of students taking Computer Science 305 is included in Computer Science 205; Data Processing 302 students are included in Data Processing 202.

(C) Reasons For Not Continuing To 300 Level Computer Science/Data Processing Course

Persons sampled were asked to indicate reasons why they did not take the 300 level Computer Science and Data Processing courses (Table IIB-3 and Table IIB-4, respectively).

For students taking Computer Science 205 but not Computer Science 305 the most frequently given reason was "not interested" (30%). Sample comments grouped under this heading were "not interested in further study in this area", "took 205 as a filler", "no further interest", "not needed to graduate", and "not necessary for career".

Twenty-four percent of the respondents indicated that there was no room in their timetable to take Computer Science 305; sample comments were "did not have time in timetable" and "needed another course". Fourteen percent of the respondents indicated that Computer Science 305 was not offered.

TABLE IIB-3

REASONS FOR NOT TAKING COMPUTER SCIENCE 305

Reasons	Number	Percentage
Not Interested	74	30%
No Room In Timetable	58	24%
Not Offered	34	14%
205 Too Difficult	28	11%
Took 205 In Grade 12	27	11%
Took Too Much Time	11	4%
Not University Entrance	9	4%
Dropped Out Of School	4	2%
	245	100%

Similar reasons were given by those people who took Data Processing 202 but not 302. The most frequently given reason was "not interested" (36%). Sample comments grouped under this heading were "did not need it to graduate", "took as a filler", "no further interest", and "not needed for career".

Twenty-four percent indicated there was no room in their timetable; 14% responded that Data Processing 302 was not offered in Grade 12.

TABLE IIB-4

REASONS FOR NOT TAKING DATA PROCESSING 302

Reasons	Number	Percentage
Not Interested	66	36%
No Room In Timetable	44	24%
Not Offered	26	14%
Took 202 In Grade 12	25	14%
Dropped Out Of School	10	6%
Not Satisfied	6	3%
Not University Entrance	4	2%
	181	100%

(D) Further Training

The data for this section refers to those respondents who graduated from high school in 1979 or earlier. This category was comprised of 488 respondents. Of these, 56% (274) indicated they had taken further training (eg. apprenticeship, community college, university, private business school) since high school. The majority, 69% (190), took computer science in high school.

Of those students who went on to post-secondary education, 41% (111), attended the University of Manitoba; 31% (85), enrolled at Red River Community College. Private business and technical schools, nurse's training at hospitals and other post-high school institutions were attended by 11% (36) of the respondents.

In terms of programs taken, the most popular programs were Science (45 students) and Arts (21 students) at the University of Manitoba and

Computer Analyst Programmer (22 students) and Business Administration (17 students) at Red River Community College.

In their program of study after high school 133 respondents indicated that they had taken further computer science or data processing courses. This represents 18% of the total sample. The majority of these, 76%, had taken computer science in high school.

When asked how well their high school computer science/data processing course prepared them for this further study, 98% of the survey participants indicated "to some extent" or "to a great extent". When tabulated by course taken in high school respondents who took computer science or a combination of courses in high school were more likely to perceive their high school course to have prepared them "to a greater extent" than other respondents (Table IIB-5).

TABLE IIB-5

STUDENTS' PERCEPTIONS OF THEIR PREPARATION FOR FUTURE COMPUTER SCIENCE/DATA PROCESSING COURSES

How Well Did Your High School Course Prepare You For Future Study	High School Course					
	Computer Science		Data Processing		Combination	
	(N)	(%)	(N)	(%)	(N)	(%)
Not At All	1	(1%)	2	(10%)	-	
To Some Extent	47	(47%)	12	(57%)	4	(31%)
To A Great Extent	53	(52%)	7	(33%)	9	(69%)
Total	101	100%	21	100%	13	100%

Of the respondents 15% (21), indicated that they received credit for their high school computer science/data processing course. Of these 21 respondents, 16 had taken computer science.

(E) Present Activity

Survey participants were asked to indicate the main activity in which they were presently engaged. Those participants who were yet to graduate from high school were not considered in this section.

There were 512 survey participants who graduated before 1980. Table IIB-6 lists the main activity for 499 respondents. The majority of these respondents, 53% (266), were employed; 38% were attending school or taking further training.

TABLE IIB-6

PRESENT MAIN ACTIVITY

Activity	(%)	(N)
Employed	53%	(266)
Unemployed	5%	(25)
In School Or Taking Further Training	38%	(190)
Keeping House Full-Time	2%	(11)
Other	1%	(7)
	100%	499

(F) Present Occupation

Two hundred and sixty-six of the respondents indicated that they were employed full-time. Of these, 247 indicated their present occupation. The largest percentage of people, 45% (113), were employed in stenographic, typing and related occupations. The second largest occupational category was service occupations with 13% (33) of the respondents (Table IIB-7).

When the results are tabulated by the course taken in high school, 62% (70) of those employed in the largest occupational category,

stenography, typing and related, took data processing in high school. In the service occupational category, 55% took computer science in high school.

PRESENT OCCUPATION

Occupation Categories	(%)	(N)
Managerial/Administrative	1%	(2)
Natural Science, Engineering and Mathematics	4%	(11)
Social Sciences	-	(1)
Teaching	-	(1)
Medicine and Health	3%	(8)
Artistic, Literary, and Performing Arts	2%	(5)
Clerical (Stenography and Typing)	45%	(113)
Sales	6%	(16)
Service	13%	(33)
Farming, Horticultural and Animal-Husbandry	1%	(2)
Food, Beverage and Related Processing	1%	(2)
Machining	2%	(5)
Product Fabricating	4%	(9)
Construction Trades	2%	(6)
Transport Equipment Operating	4%	(11)
Material Handling	1%	(3)
Other Crafts and Equipment Operating	1%	(2)
Unclassified	7%	(17)

When asked if their present occupation was related to their computer science/data processing course, 15% (39) of the 266 respondents who were employed full-time indicated "Yes". About 50% (21) of these people took computer science in high school.

TABLE IIB-8

PRESENT OCCUPATION BY TYPE OF HIGH SCHOOL COURSE
(COMPUTER SCIENCE, DATA PROCESSING)

Occupation Categories	Computer Science (%)	Computer Science (N)	Data Processing (%)	Data Processing (N)	Combination (%)	Combination (N)
Managerial/Administration	1%	(1)	1%	(1)	-	
Natural Science, Engineering and Mathematics	6%	(7)	3%	(3)	5%	(1)
Social Sciences	1%	(1)	-		-	
Teaching	1%	(1)	-		-	
Medicine and Health	4%	(5)	3%	(3)	-	
Artistic, Literary, and Performing Arts	1%	(1)	3%	(3)	5%	(1)
Clerical (Stenography and Typing)	30%	(37)	60%	(70)	29%	(6)
Sales	7%	(8)	5%	(7)	5%	(1)
Service	15%	(18)	9%	(11)	18%	(4)
Farming, Horticultural and Animal-Husbandry	1%	(1)	-		5%	(1)
Food, Beverage and Related Processing	-		1%	(1)	5%	(1)
Machining	2%	(3)	-		10%	(2)
Product Fabricating	5%	(6)	3%	(3)	-	
Construction Trades	4%	(5)	1%	(1)	-	
Transport Equipment Operating	7%	(8)	3%	(3)	-	
Material Handling	-		3%	(3)	-	
Other Crafts and Equipment Operating	2%	(2)	-		-	
Unclassified	15%	(19)	5%	(7)	18%	(4)
	100%	(123)	100%	(116)	100%	(21)

A further analysis of these 39 students indicated that 9 of them, 23%, came from a Non-Network school. The remaining 30 students came from Network schools. Nineteen of the 39 students, 49%, attended a post-secondary institution after high school. An analysis of the institution attended and the program taken, Table 11B-9, indicated that the majority of these students, 52% (10), went to Red River Community College; one-half of these students enrolled in the Computer Analyst Programmer course.

TABLE IIB-9

POST-SECONDARY INSTITUTION ATTENDED AND PROGRAM TAKEN FOR THOSE STUDENTS WITH COMPUTER/DATA PROCESSING RELATED JOBS

Post-Secondary Institution	Program	Number of Students
Red River Community College	Computer Analyst Programmer	5
	Computer Technology	1
	Electronic Technology	1
	Medical Laboratory Technician	1
	Marketing	1
	Not Stated	1
University Of Manitoba	Science	3
	Arts	1
Other In Manitoba	Nurses' training in hospitals	1
	Commercial College	1
	Other	2
Other Outside Manitoba	Engineering	1
		19

(G) Computer Languages Used On-The-Job

For the 39 people who indicated that they had a computer science/ data processing related job, Table IIB-11 presents the languages used on-the-job. The largest number of people indicated that they used Basic on-the-job; this was followed by "other" languages.

TABLE IIB-10

COMPUTER LANGUAGES ON-THE-JOB

Computer Languages	Number of Respondents* Using Languages
Basic	21
Cobol	9
Fortran	9
Assembler	11
Other**	17

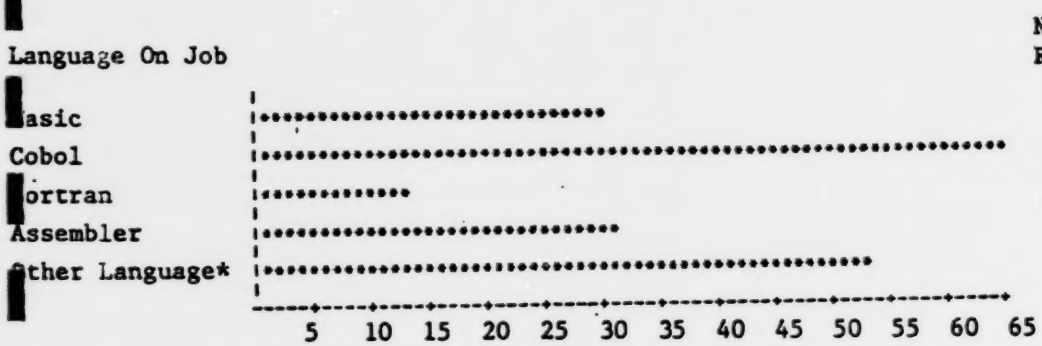
*Respondents could cite more than one language.
**Other includes Spectre, Cardiac.

Figures 1, 2 and 3 present the mean percentage of time each language is used on-the-job by the course taken in high school.

FIGURE 1

PERCENT OF TIME LANGUAGE IS USED ON-THE-JOB
FOR COMPUTER SCIENCE STUDENTS

Number of Students = 21
BAR CHART OF MEANS



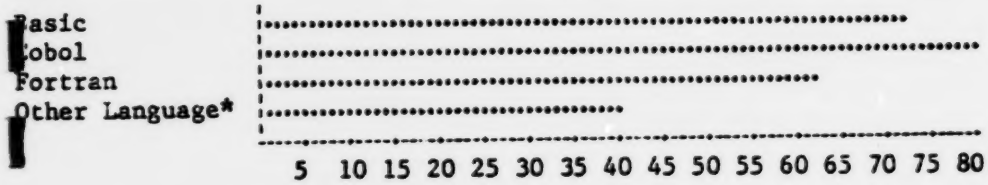
Language On Job	Number of Responses	Percent Mean
Basic	8	30%
Cobol	3	65%
Fortran	4	13%
Assembler	7	31%
Other Language*	13	53%

*Other includes Spectre, Cardiac.

FIGURE 2

PERCENT OF TIME LANGUAGE IS USED ON-THE-JOB
FOR DATA PROCESSING STUDENTS

Number of Students = 13
BAR CHART OF MEANS


Language On Job
Basic
Cobol
Fortran
Other Language*
5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80
Mean % Of Time Language Used On Job

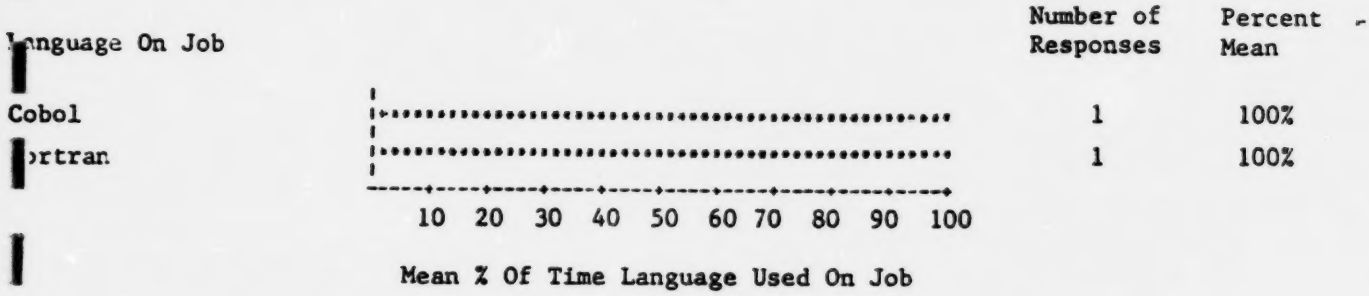
Language On Job	Number of Responses	Percent Mean
Basic	3	72%
Cobol	2	80%
Fortran	2	62%
Other Language*	1	40%

*Other includes Spectre, Cardiac, Assembler.

FIGURE 3

PERCENT OF TIME LANGUAGE IS USED ON-THE-JOB
FOR STUDENTS TAKING BOTH COMPUTER SCIENCE AND DATA PROCESSING

Number of Students = 2
BAR CHART OF MEANS



(H) Computer Languages Taken In High School

Respondents were asked to indicate what computer languages they had taken in high school (Table IIB-

Of the total respondents, 34%, indicated that they studied Fortran in high school. The next most frequently studied languages were Basic and Cobol, 25% and 21%, respectively.

Of those students who took Fortran in high school, 59% of them were Computer Science students. Similarly, 56% of those students who took Basic in high school and 49% of those who took Cobol were Computer Science students.

TABLE IIB-11

COMPUTER LANGUAGES TAKEN IN HIGH SCHOOL BY COURSE

Computer Language	High School Course: Computer Science (%) (N)	Data Processing (%) (N)	Combination (%) (N)	Unclassified (%) (N)	Total (%) (N)
Basic	56% (226)	36% (147)	6% (26)	1% (4)	25% (403)
Cobol	49% (165)	41% (139)	8% (28)	1% (4)	21% (336)
Fortran	59% (324)	33% (183)	7% (36)	2% (9)	34% (552)
Assembler	73% (37)	20% (10)	4% (2)	4% (2)	3% (51)
Spectre	68% (158)	21% (49)	10% (24)	1% (2)	14% (233)
Other**	61% (20)	24% (8)	12% (4)	3% (1)	2% (33)
	100				1608*

*Respondents could cite more than one language.
**Other includes Cardiac, Spectre Map.

Figures 4, 5 and 6 give the mean percentage of time each language was used in high school by course, computer science, data processing and combination.

FIGURE 4

PERCENT OF TIME LANGUAGE WAS USED IN HIGH SCHOOL
FOR COMPUTER SCIENCE STUDENTS

Number of Students = 411
BAR CHART OF MEANS

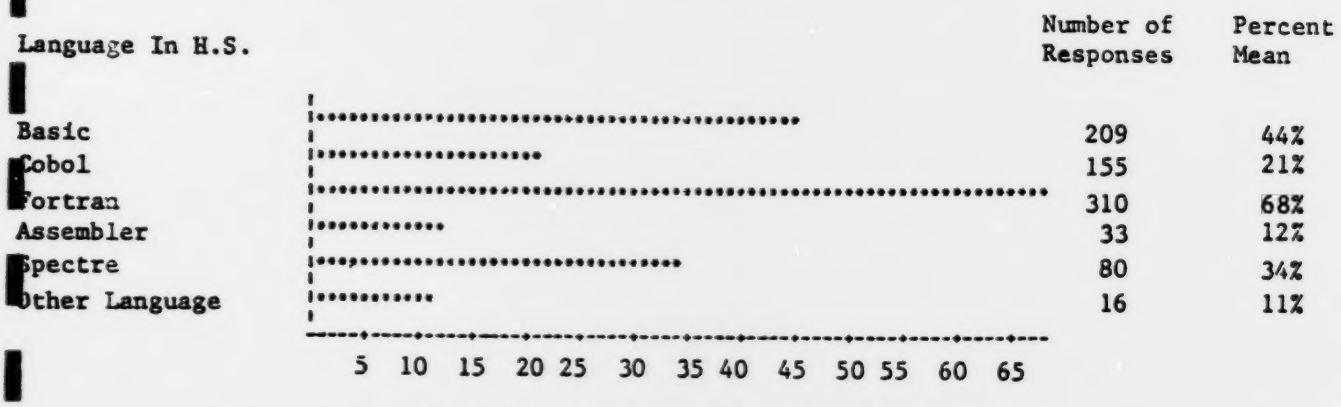


FIGURE 5

PERCENT OF TIME LANGUAGE WAS USED IN HIGH SCHOOL
FOR DATA PROCESSING STUDENTS

Number of Students = 233
BAR CHART OF MEANS

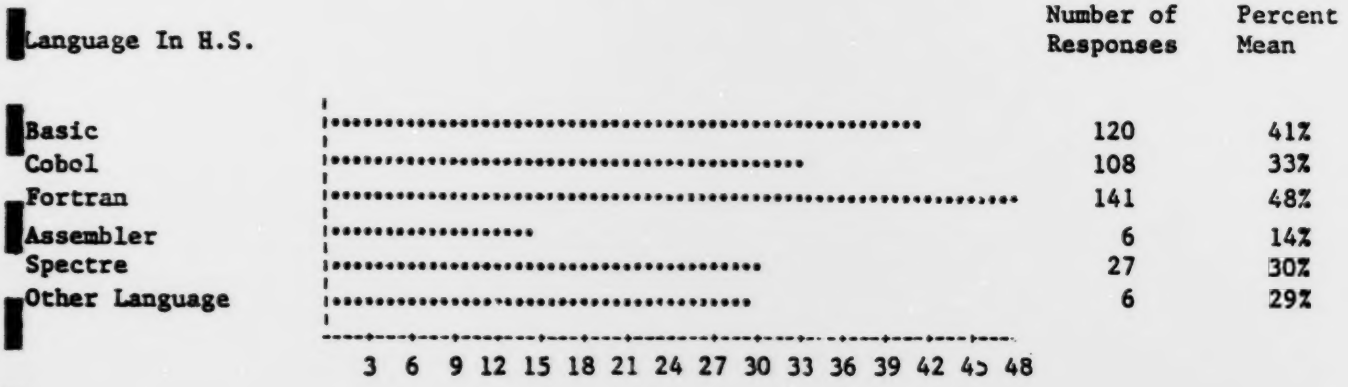
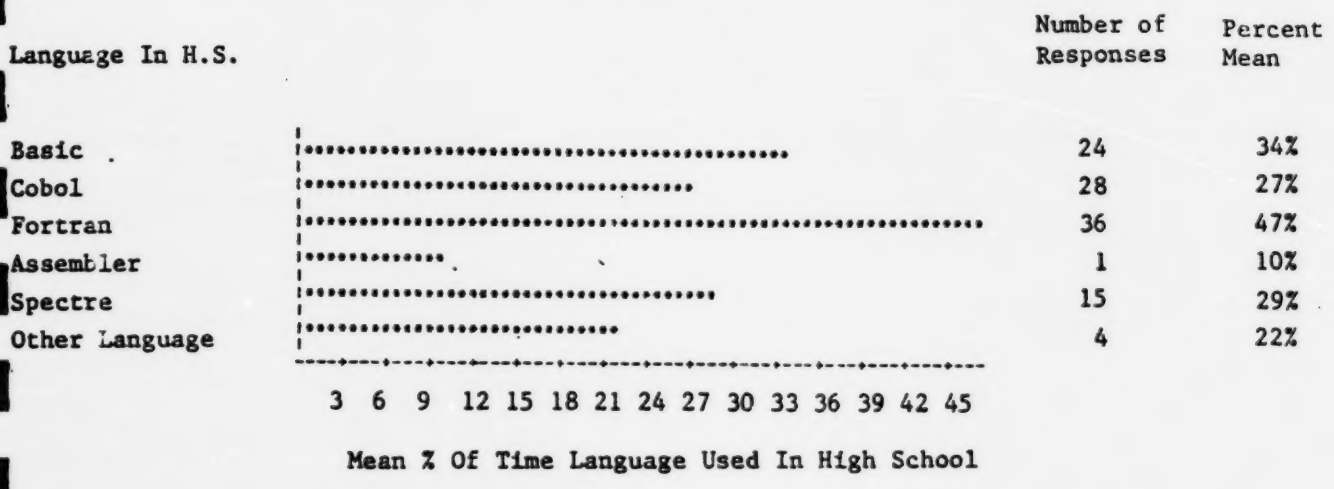


FIGURE 6

PERCENT OF TIME LANGUAGE WAS USED IN HIGH SCHOOL
FOR STUDENTS TAKING BOTH COMPUTER SCIENCE AND DATA PROCESSING

Number of Students = 41
BAR CHART OF MEANS



(I) Satisfaction With Course

Those surveyed were asked to indicate their degree of satisfaction with various aspects and services of their computer science/data processing course. It is evident from Table IIB-12 that for all aspects listed, the majority of the respondents were "satisfied" or "very satisfied" with their course. One area where there was a considerable number of respondents "dissatisfied" or "very dissatisfied" was in the area of availability of equipment where 31% of the students expressed some dissatisfaction.

TABLE IIB-12

SATISFACTION WITH VARIOUS ASPECTS AND SERVICES OF COMPUTER SCIENCE/DATA PROCESSING COURSES

Aspect	Very Satisfied (%) (N)	Satisfied (%) (N)	Undecided (%) (N)	Dissatisfied (%) (N)	Very Dissatisfied (%) (N)
Overall Quality of Instruction	33% (238)	51% (368)	6% (44)	7% (50)	2% (17)
Instructor Interest in Students	50% (360)	36% (262)	6% (43)	6% (41)	2% (12)
Instructor Availability After Class	37% (262)	40% (284)	15% (105)	7% (53)	2% (12)
Availability of Equipment	19% (139)	39% (285)	10% (174)	24% (174)	7% (48)
Reliability of Equipment	16% (118)	51% (363)	14% (102)	14% (133)	4% (30)
Job Processing Time	20% (135)	49% (327)	23% (156)	5% (37)	2% (16)
Equipment Used in the Course	22% (156)	53% (379)	11% (81)	11% (79)	3% (22)

(J) Would You Choose Computer Science/Data Processing As A Course Option Again?

Of the 684 responding to the question asking whether or not they would take a computer science/data processing course as a high school option again, 84% (574) said "Yes" and 16% (110) said "No". Little difference existed between computer science and data processing students.

(K) Reasons For Not Choosing Computer Science/Data Processing As A Course Option Again

Respondents who indicated they would not choose computer science or data processing as a course option again were asked to indicate reasons for not doing so (Table IIB-13).

Of the 105 responding, the majority of these, 54%, indicated that they would not choose computer science/data processing as a high school option again because they were "not interested" in the area. The second most often cited reason was "too difficult".

TABLE IIB-13

REASONS FOR NOT CHOOSING COMPUTER SCIENCE/DATA PROCESSING AS A HIGH SCHOOL OPTION AGAIN BY COURSE TAKEN IN HIGH SCHOOL

Reasons	Computer Science (%) (N)	Data Processing (%) (N)	Combination (%) (N)	Unclassified (%) (N)	Total (%) (N)
Not Interested	65% (37)	33% (19)	-	2% (1)	54% (57)
Too Difficult	41% (7)	59% (10)	-	-	16% (17)
Not Satisfied with Course, Equipment Instructor	56% (5)	44% (4)	-	-	9% (9)
Would Not Want That Type of Job, Career	22% (2)	67% (6)	11% (1)	-	9% (9)
Too Time Consuming	80% (4)	20% (1)	-	-	5% (5)
Not Useful Unless Followed Up In Post-Secondary	50% (2)	50% (2)	-	-	4% (4)
No Practical Application	75% (3)	-	-	25% (1)	4% (4)
					100 105

IV. GENERAL OBSERVATIONS

1. The majority of students taking Computer Science/Data Processing reported overall academic averages of B or better.
2. Very few students continued with Computer Science or Data Processing after having taken the 20X level course. Forty percent of the students taking Computer Science and 30% of those taking Data Processing went on to the 30X level course.
3. Respondents indicated that the main reason they did not take the 30X level courses was that they were not interested. It is interesting to note that when principals and Computer Science teachers were asked about their perceptions of why students did not continue with the 30X level courses, they indicated it was because the courses were not recognized as university entrance courses. This reason was ranked seventh by respondents to the follow-up questionnaire.
4. About one-quarter of those respondents who had graduated from high school had taken a post-secondary course in Computer Science/Data Processing.
5. Few students (39) after having taken Computer Science or Data Processing in high school, had a Computer Science/Data Processing related job. The largest group of these students came from a non-Network school. Nineteen of these students enrolled in a post-secondary institution. The majority took community college training in a computer field (Computer Technology, Computer Analyst Programmer).
6. There would appear to be a lack of congruence between computer languages used on-the-job and computer languages taken in high school. Basic was used most often on-the-job, yet Fortran was taught most often in high school.
7. Equipment-related concerns were the source of most dissatisfaction of respondents with their Computer Science/Data Processing course.

SECTION III

PROGRAM LIBRARY USER'S MANUAL (PLUM)

I. INTRODUCTION

(A) Objective

The objective of this section is to determine the degree to which the Network achieves its objective of: "Providing support to other school services, especially those services which will help improve the efficiency of school operation and student performance." This section will deal specifically with the Program Library User's Manual (PLUM). As such, the objectives of this section are to ascertain:

- teacher awareness of PLUM
- teacher utilization of PLUM
- teacher attitudes concerning PLUM

(B) Background and Description

PLUM consists of a library of pre-written and stored programs available since 1974 for use through the Network. Unlike the computer-related courses, it is contended that PLUM has a potential of reaching 100% of the students in Network schools. Owing to the variety of subjects, for which approximately 70 programs are available, PLUM is seen as a valuable teaching aid providing supplemental material not otherwise available. As such PLUM is viewed as "enhancing learning in practically every course offered in high school".[1]

II. METHODOLOGY

(A) Questionnaire Design

The survey instrument was developed by members of the Research Branch in consultation with Computer Services Personnel and field personnel.

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[1] Source: Computer Services outline paper entitled; Manitoba Computer Network, p. 2.

It was designed so that a specific subject taught during the 1979/80 school year was referenced when the teachers reported their attitudes, awareness, and utilization of PLUM.[2]

(B) Sample Selection/Field Methods

A systematic random sample using a random start was employed to select the survey population. The sampling frame consisted of all teachers from Network schools appearing on the Subject-Class-Size Data file. A 2/3 sample of the teacher population of the 36 Network schools resulted in 1020 names being selected. The rationale for employing this sampling procedure was to enable the researcher to take the results of the data collected as being representative of all teachers in the 36 schools. The questionnaires were individually addressed and given to the principals at each of the Network schools during the in-person interviews conducted as part of the overall evaluation.[3]

All of the Network schools returned completed questionnaires for processing. Of the 1020 teachers surveyed in these schools 872 or 85% returned their completed questionnaires (Table III-1).

III. RESULTS AND DISCUSSION OF FINDINGS

(A) Teacher Awareness of PLUM

It appears that teachers aware of PLUM are in the minority of the teaching population in Network schools.

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[2] A copy of the PLUM questionnaire may be found in Appendix C.

[3] Two evaluation packages were mailed to the principals of two Network schools.

TABLE III-1

PROJECTED SAMPLE SIZE AND ACTUAL RESPONSE RATES
FOR RURAL AND URBAN PLUM EVALUATION PARTICIPANTS

Population	Projected Sample Size (N)	Response Rate (N)	(%)
Schools:			
Rural	11	11	100
Urban	25	25	100
Overall	36	36	100
Teachers:			
Rural	237	188	79%
Urban	783	684	87%
Overall	1020	872	85%

TABLE III-2

AWARENESS OF PLUM BY TEACHING CATEGORY

	AWARENESS OF PLUM		
TEACHING CATEGORY	NO (%)	YES (%)	TOTAL N
MATHEMATICS	37%	63%	115
SCIENCE	36%	64%	114
SOCIAL STUDIES	63%	37%	100
HOME ECONOMICS	58%	42%	36
LANGUAGE ARTS/ ENGLISH	75%	25%	146
VOCATIONAL/PRACTICAL ARTS	78%	22%	125
SECOND LANGUAGE	80%	20%	35
ART/MUSIC	100%	-	34
PHYSICAL EDUCATION	70%	30%	43
COUNSELLING	75%	25%	16
BUSINESS EDUCATION	54%	46%	94

Overall, less than 40% of the teachers surveyed were aware of the PLUM programs available through the Network (Question 2).[4] This was found to change very little when teaching category was taken into consideration. Teachers of mathematics and science most often responded that they were aware of PLUM (Table III-2).

Teachers aware of PLUM most often cited "a teacher in my school" as being their information source (Question 3). While a lower percentage of teachers knew the contact person at the Department of Education, this does not appear to present a problem. Teachers wanting information about PLUM indicated that they knew whom to contact in their schools (Table III-3).

B. Teacher Utilization of PLUM

As one might expect from the relatively low stated awareness of PLUM, a small proportion of the teachers surveyed utilized PLUM programs.

When observing the frequency of utilization among all teachers surveyed, it became apparent that less than 20% had used PLUM (Table III-4). The user group most often stated PLUM was used for instructional purposes "to motivate students" (Question 5 and 6).

It should be noted that this user group makes up approximately 50% of all teachers who stated awareness of PLUM (Question 4).

Teachers least likely to utilize PLUM were in the Art/Music, Counselling categories (Table III-5). One should bear in mind that no programs, other than a general purpose marking program, exist for these categories. This may account for the most often stated reason for not using PLUM as as being "it does not fit into my program" (Question 10).

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[4]All questions referred to in the text may be found in Appendix C.

TABLE III-3
AWARENESS OF INFORMATION SOURCES IN THE SCHOOL AND AT THE DEPARTMENT OF EDUCATION

DO YOU KNOW WHOM TO CONTACT?	ARE YOU AWARE OF PLUM NO (%)	YES (%)
IN THIS SCHOOL		
NO	47%	3%
YES	53%	97%
TOTAL N =	517	298
AT THE DEPARTMENT		
NO	91%	57%
YES	9%	43%
TOTAL N =	478	263

TABLE III-4
OVERALL PLUM AWARENESS/UTILIZATION

NOT AWARE (%)	AWARE: DID NOT USE (%)	AWARE: DID USE (%)	TOTAL N
60%	22%	19%	872

TABLE III-5
UTILIZATION OF PLUM BY TEACHING CATEGORY

TEACHING CATEGORY	UTILIZATION OF PLUM: NO (%)	UTILIZATION OF PLUM: YES (%)	TOTAL N
MATHEMATICS	42%	58%	72
SCIENCE	42%	58%	74
SOCIAL STUDIES	59%	42%	41
HOME ECONOMICS	35%	65%	17
LANGUAGE ARTS/ENGLISH	68%	32%	38
VOCATIONAL/PRACTICAL ARTS	77%	23%	31
SECOND LANGUAGE	75%	25%	8
ART/MUSIC	100%	-	6
PHYSICAL EDUCATION	39%	62%	13
COUNSELLING	80%	2%	5
BUSINESS EDUCATION	59%	41%	46

The largest number of teachers utilizing PLUM programs were found in the Science and Mathematics categories. However, it was observed that these teachers were not the group most likely to use the programs. While a smaller number of teachers in the Home Economics category utilized PLUM programs they were the most likely to do so once they became aware of them (Table III-6).

The PLUM "user group" appeared to be very satisfied with different aspects of PLUM. For example, 95% of the teachers using PLUM stated that it served their purposes "moderately" or "very well" (Question 7). Another indication of user satisfaction was that 88% of the user group indicated that they would use PLUM again (Question 9).

A further component of PLUM with which both users and non-users appear to be satisfied is PLUM instructions. Ninety percent of the teachers who utilized PLUM indicated that they felt PLUM instructions "were easy to understand". Less than 10% of the user group felt that the instructions "were difficult to understand" (Table III-7).

One should keep in mind that while a majority of teachers using PLUM appeared to be satisfied with its various aspects, this user group constitutes less than 20% of the teachers sampled.

(C) Teacher Attitudes Concerning PLUM

The high degree of satisfaction exhibited by the user group appears to be reflected in positive teacher attitudes towards PLUM.

Over 90% of the PLUM users felt that it should continue in its present form and would recommend it to their colleagues (Tables III-8 and III-9). Those teachers who would like PLUM to change its form most often felt it was "too time consuming for benefits gained" (Question 12). Form was seen as referring to the delivery system used in getting PLUM into the schools. It was interesting to note the inconsistency which became apparent

TABLE III-6
THE RANKING OF THE PERCENTAGE OF TEACHERS AWARE OF PLUM WHO USED IT BY THEIR TEACHING CATEGORY

TEACHING CATEGORY	STATED AWARENESS (N)	STATED USAGE (N)	UTILIZATION RATIO* (%)	RANK
HOME ECONOMICS	15	11	73%	1
PHYSICAL EDUCATION	13	8	62%	2
SCIENCE	73	43	59%	3
MATHEMATICS	72	42	58%	4
SOCIAL STUDIES	37	17	46%	5
BUSINESS EDUCATION	43	19	44%	6
LANGUAGE ARTS/ENGLISH	37	12	32%	7
SECOND LANGUAGE	7	2	29%	8
VOCATIONAL/PRACTICAL ARTS	27	7	26%	9
COUNSELLING	4	1	25%	10

*U.R.= $\frac{\text{Stated Usage}}{\text{Stated Aware.}} \times 100$

TABLE III-7
TEACHER UTILIZATION OF PLUM BY THE CLARITY OF PLUM INSTRUCTIONS

	PLUM INSTRUCTIONS			
TEACHER UTILIZATION (%)	DIFFICULT TO UNDERSTAND (%)	EASY TO UNDERSTAND (%)	I DO NOT KNOW (%)	TOTAL N
NO	5%	18%	78%	125
YES	9%	90%	1%	150

TABLE III-8
TEACHER UTILIZATION OF PLUM BY WHETHER PLUM SHOULD BE CONTINUED IN ITS PRESENT FORM

	PLUM CONTINUED		
TEACHER UTILIZATION	NO (%)	YES (%)	TOTAL N
NO	19%	81%	79
YES	6%	94%	148

TABLE III-9
TEACHER UTILIZATION OF PLUM BY WHETHER THEY WOULD RECOMMEND IT TO THEIR COLLEAGUES

	WOULD YOU RECOMMEND PLUM		
TEACHER UTILIZATION	NO (%)	YES (%)	TOTAL (N)
NO	27%	73%	83
YES	4%	96%	146

TABLE III-10
TEACHER UTILIZATION OF PLUM BY WOULD YOU CHANGE PLUM AS IT NOW EXISTS

	WOULD YOU CHANGE PLUM		
TEACHER UTILIZATION	NO (%)	YES (%)	TOTAL (N)
NO	66%	34%	64
YES	59%	41%	127

when asking teachers whether they would change PLUM. Approximately 40% of the users group indicated that they would make changes to PLUM (Table III-10). Teachers most often stated that these changes would consist of "introducing more PLUM programs" (Question 14). This would seem to reaffirm the satisfaction this user group has with PLUM.

When looking at the attitudes of the user group towards PLUM and the positive nature of their responses, one should also take into consideration the positive nature of the non-user responses. One might ask whether these responses deal with the usefulness of the PLUM programs themselves or with the fact that PLUM is one of the many services that teachers do not want to see eliminated.

IV. GENERAL OBSERVATIONS

Arising out of the findings are some general observations dealing with this section's objectives.

It appears that PLUM is the one high school component that has been established to serve the second objective of the Network. If, in fact this objective is a goal of the Netowrk, possibly, it may be achieved through the introduction of additional service components. If additional components are not introduced, however, the objectives may be too broad to be met by PLUM alone with any degree of success.

1. Teacher Awareness of PLUM

If PLUM is to live up to its potential of reaching 100% of the students in Network schools, a larger proportion of the teaching population will have to be made aware of it.

2. Teacher Utilization of PLUM

With only 18% of teachers using PLUM it would appear that it is not "enhancing learning in practically every course offered in high school."

In light of the expenditure in providing PLUM, a more feasible alternative may be available which would result in higher PLUM utilization.

3. Teacher Attitudes Concerning PLUM

Teachers who have used PLUM appear to have positive attitudes towards it. However, PLUM was most often viewed as a motivational tool, not as a means of providing supplemental material.

SECTION IV

COMPUTER ASSISTED LEARNING (CAL) PROJECT FOR SPECIAL NEEDS CHILDREN AND ADOLESCENTS

I. INTRODUCTION

(A) Objective

The objective of this section is to determine the degree to which the High School Computer Network achieves its objective of: "Providing support to other school services, especially those services which will help improve the efficiency of school operation and student performance."

Specifically, Section IV will address:

- The present services being offered by the CAL Project;
- Project costs;
- Teachers' perceptions of the benefits, problems and overall effectiveness of the CAL Project; and
- Parents' awareness and perceptions of the benefits and problems of computer assisted learning.

(B) Background and Description

The Computer Assisted Learning Project was introduced as a means of providing additional assistance to special needs children and adolescents. It was intended that the project would:

- Provide individualized instruction;
- Develop students' motor skills, perceptual-motor skills as well as other learning skills;
- Provide a flexible form of instruction;
- Improve teacher efficiency; and
- Aid in remediation for special needs students.

The Computer Assisted Learning Project began as a pilot project in May of 1974 with Lord Roberts/Ellen Douglas School, Park Circle Secondary School and the Manitoba School for the Deaf. Britannia Elementary entered in September of the following year. The Project has since expanded to include ten schools during the 1979-80 school year; two schools are presently in the process of joining the Project.

Approximately 700 students participated in the Computer Assisted Learning Project during the 1979/80 school year. The categories of students included physically handicapped, mentally handicapped, and multiple handicapped students as well as ESL students, deaf students, and students requiring resource or remedial help.

II. METHODOLOGY

(A) Limitations

The study provides an indication of teachers' attitudes towards computer assisted learning and the CAL Project. It describes teachers' perceptions of the problems and benefits of the CAL Project as well as other factors, such as the support they receive from University of Manitoba personnel. Although some hard data exists on costs and equipment, the bulk of the data presented reflects attitudes and perceptions.

Also, parents' attitudes and their perceptions of their children's attitudes towards computer assisted learning, constitute another aspect of this report. Owing to the diversity of students' abilities and handicaps, a single instrument to measure the attitudes of all students could not be constructed. A variety of instruments would introduce problems concerning a lack of comparable data. Therefore, parents were questioned as to whether their child liked working with the computer. It was felt that this approach would give a general indication of student attitudes and would have the advantage of producing comparable data. It should be noted that this does

not provide a direct reflection of student attitudes, rather it reflects parental perceptions of their child's attitude.

Due to the time constraints of the study, it was not possible to implement a pre-test post-test control group design which would have provided comparisons of student performance between students participating in the Computer Assisted Learning Project and non-CAL students. A number of studies have been done in Manitoba concerning the impact of computer assisted instruction on student learning.[1] In fact, uses of computer assisted learning are still being studied. However, this study focuses on teacher and parent/guardian attitudes and perceptions of computer assisted learning.

A further limitation of the section concerning the parent/guardian questionnaire is that parents/guardians of adolescents at the Manitoba Youth Centre were excluded from the sample, owing to problems involved with releasing adolescents' names and addresses. It was felt that this omission would not adversely affect the outcomes of the study.

(B) Questionnaire Development

Both survey instruments were developed by members of the Research Branch in consultation with Dr. Lauran Sandals, (CAL Co-ordinator at the University of Manitoba), and with field personnel.

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[1]The following theses discuss Computer Assisted Learning with special needs students. All were conducted under the supervision of Dr. L. Sandals, Co-ordinator of the CAL Project. See: Fiorentino, O.P.L. "Computer Assisted Learning for Pupils with Learning Disorders," University of Manitoba, unpublished M. Ed. thesis, 1977; Hill, C.A. "Computer Assisted Learning with the Physically Handicapped," University of Manitoba, unpublished M. Ed. thesis, 1976: and, Reeves, L.C. "Computer Assisted Learning with Students Who Are Deaf," University of Manitoba, unpublished M. Ed. thesis, 1978.

The survey of parents/guardians was designed to determine parental awareness of the Computer Assisted Learning Project and parental attitudes towards computer assisted learning in general. Parents also were asked to indicate whether they felt their child's school work and/or attitude towards school had changed as a result of working with the computer.

The survey of teachers was designed to gather information on student placement procedures, problems with the CAL Project, benefits of the project, the amount of student contact time, and their perceptions of the Project's overall effectiveness.

(C) Sample Selection

The principal of each participating school was interviewed to gain background information, the names and address of students, and names of teachers involved in the Project. These lists constituted the basis for the parent/guardian and teacher samples.

All teachers involved in the CAL Project in the ten participating schools were surveyed for a total of 27 teachers. Parents/guardians of all students participating in the Computer Assisted Learning Project following Spring Break were included in the sample.[2] This totalled 563 parents/guardians.

(D) Field Methods and Response Rate

Teachers and parents/guardians were surveyed by means of mail-out questionnaires. In the case where a parent/guardian had more than one child participating in the CAL Project the parent/guardian was sent one questionnaire. only.

The response rate for the teacher survey was 96%, while the response rate for the parent/guardian survey was 64% (Table IV-1).

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[2]Note the previously mentioned exception of the Manitoba Youth Centre.

TABLE IV-1

PROJECTED SAMPLE SIZE AND ACTUAL RESPONSE RATE
FOR COMPUTER ASSISTED LEARNING PROJECT SURVEYS:
TEACHER AND PARENT/GUARDIAN SAMPLES

Population	Projected Sample Size	Response Rate (N)	(%)
Teachers	27	26	96%
Parents/Guardians	563	360	64%

III. RESULTS AND DISCUSSION OF FINDINGS

(A) School Situation

Methods for the day-to-day implementation of the CAL Project vary from school to school, as does the number of participating students per school. Some schools have one teacher solely responsible for the operation of the CAL Project, while in other schools a number of teachers work co-operatively to run the Project. The number of students working with the computer, as of March 1980, varied from 21 students to 96 students.

The contact time that each student is allotted per five day calendar week constitutes another variable. The time per student ranges from 10 minutes to 140 minutes per week (Question 5).[3] The category of student, the priorities of the school, and the equipment available all may influence the time factor.[3]

All schools, with one exception, own a teletype, some have additional equipment. The original purchase cost for the teletypes varied, depending

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[3] Appendix D contains a copy of both the teacher and parent questionnaires. Question numbers refer to the appropriate question on each instrument.

on the year of purchase. However, in the overall costing picture for the CAL Project, no costs have been allocated for the equipment as the schools now own the equipment and there is no cost for present usage. The equipment has not been included as an asset as it has little or no re-sale value.

Each school paid $2000 a year to the CAL Project Co-ordinator for support staff and software development. All schools participating in the Project in the 1979-80 school year were connected to Cybershare on an interactive basis.[4] The Department of Education paid $6000 to Cybershare for the 1979-80 school year to support the CAL Project. This cost has been equally divided among participating schools as more specific per school costs cannot be extracted because Cybershare treated all schools in the Project as a single user.

Each school paid its own line costs. These varied depending on whether the school utilized an acoustic coupler or a data set. Line costs were calculated on a twelve month basis as the school must pay for the line throughout the summer in order to avoid additonal Manitoba Telephone System service charges.

The only overhead cost attributable to the CAL Project was the cost of summer (STEP) students who work refining old programs and developing new ones. The Province of Manitoba paid the cost of all STEP students. No other staff costs have been allocated, as no Department of Education staff resources were used in the operation of the CAL Project.

Other costs, such as paper and maintenance, were paid by each school. They have been included in the total cost picture.

The total cost to operate the CAL Project equals approximately $44,110 per year. This translates to an average cost for each of the ten participating schools of about $4411.

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[4]Opaaquia Elementary in The Pas will be using a micro computer for CAL when the Project is fully operative.

(B) Perceptions and Attitudes of Teachers and Parents/Guardians

(i) Teacher Questionnaire

The teacher questionnaire was designed to collect background information on teachers involved in the Computer Assisted Learning Project, as well as to gather information on teacher attitudes and perceptions of computer assisted learning and the CAL Project.

Background: Teachers were asked to identify the category to which they belonged. Almost half the respondents (46%) identified themselves as a regular "classroom teacher" (Question 1). "Resource teachers" constituted the second largest category (31%). The majority of the respondents have been involved in the CAL Project for more than a year (73%) (Question 2), while 35% indicated they had some specialized training in the area of computer assisted learning. The most frequently cited example of such training was "University of Manitoba (Faculty of Education) CAL course(s)" (Question 3). Generally, it appears most teachers are familiar with computer assisted learning, either as a result of working with the Project over time and/or as a result of receiving specialized training in the area.

Assistance Provided to Schools: The CAL Project supplies personnel to assist with the Project in all participating schools regardless of whether teachers have any specialized training.[5] The survey instrument incorporated a question to measure teacher awareness of and satisfaction with this assistance. Approximately one-third of the teachers sampled stated they did not

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[5] Each school is a Research Assistant, plus each school may receive assistance from the CAL Supervisor and/or CAL Co-ordinator.

receive assistance from "University of Manitoba personnel (i.e. Research Assistant(s), CAL Supervisor, CAL Co-ordinator.") (Question 4a). Of the teachers who were aware of the assistance, 75% stated they were "satisfied" or "very satisfied" (Question 4b). The remaining 25% were "somewhat satisfied." No teacher indicated any degree of dissatisfaction with the service.

Operation of CAL Project: The teacher questionnaire included information on selection of students who participate in the Project and on the average amount of time each student used the computer per five day calendar week.

Regarding placement procedures, the respondents most often stated that the "classroom teacher" or the "resource teacher" chose the participating students (Question 7). Consistent with this, the criteria most frequently used to select students were reported to be "classroom teacher's recommendation" and "resource teacher's recommendation" (Question 8).

Seven teachers in the sample (27%) perceived that the time each student had to use the computer did not allow for effective work (Question 6a). It should be noted that all these respondents reported that, on average, each of their students used the computer for 30 minutes a week or less (Table IV-2). These teachers would like to see students receive a minimum contact time ranging from 20 to 100 minutes per week (Question 6b). Overall, it can be observed that a positive relationship exists between the increase in the amount of student contact time and teacher perceptions of effectiveness (Table IV-2).

A listing of schools demonstrates that there were teachers in four schools who did not feel their students were receiving enough time on the computer. However, in one of the schools only one teacher in four perceived that students needed more time. The eight teachers from one school were evenly split in their opinions as to whether students has sufficient time on the computer. They were also divided in their opinions as to how much time per week each student

TABLE IV-2
AVERAGE NUMBER OF MINUTES EACH STUDENT USES THE COMPUTER PER WEEK BY TEACHER RESPONSE AS TO WHETHER TIME ALLOWS THE STUDENT TO WORK EFFECTIVELY WITH THE COMPUTER

	TIME	
Average Number of Minutes per Student Per Week	Not Enough Time (N)	Is Enough Time (N)
0 - 30 Minutes	7	4
31 - 60 Minutes	-	7
61 - 90 Minutes	-	2
90+ Minutes	-	3
Number of Respondents	7	16

actually used the computer. These discrepancies could result from a number of factors, such as having students at different grade levels receiving different amounts of contact time per week. For this school, total weekly time used could not be computed because of these variations. Therefore, it is not possible to determine whether or not there is a lack of hardware in this school. Teachers who perceived a shortage of contact time might have done so as a result of administrative, instructional, and/or hardware problems.

In two schools it appears that a lack of hardware is not the factor which restricts student contact time. For example, one school had 34 students using the computer for an average of 30 minutes each per week. This totals 17 hours per week of usage. If it is assumed that a school day, (including recess), contains approximately five and a half hours, then twenty-seven and a half hours per week are theoretically available. Students in the other school utilized the computer for approximately nineteen and a half hours per week (20 min. x 59 students). It appears that in both cases some additional time is available. Therefore, the perceived shortage of student contact time could result from other influencing factors present in the school situation.

Functions of CAL Project: Concerning the primary use of the computer, 75% of respondents indicated that primarily they used the computer to "drill students on skills already taught" (Question 9). However, of the 11 classroom teachers, three used the computer primarily "to increase student motivation" (Table IV-3). When asked to identify the three most important aspects of the Computer Assisted Learning Project, the aspects most often chosen by teachers were: (1) "provide individualized instruction"; (2) "provides immediate feedback to students"; and, (3) "provides supplementary remediation" (Question 10). It appears that teachers viewed the computer as a tool to individualize routine drills for students.

TABLE IV-3
PRIMARY USE OF THE COMPUTER BY TYPE OF TEACHER

Primary Use	TYPE OF TEACHER			
	Classroom Teacher (N)	Resource Teacher (N)	Special Class Teacher (N)	Teacher Aide (N)
Drill Students on skills already taught	7	7	3	1
Teach New Skills	1	-	-	-
Increase Student Motivation	3	-	1	-
Other: eg. Provide a Comparison to other learning programs	-	1	-	-
Number of Respondents	11	8	4	1

Problem Areas: The questionnaire identified a number of potential problem areas. Teachers were asked whether they had encountered problems with CAL programs, with the mechanics and operation of the computer and/or with student learning.

The CAL programs in the areas of mathematics and language arts were used by almost all teachers (Question 11). Half the respondents indicated that they encountered problems with the CAL programs they used (Question 12a). The most frequently cited problem was the "limited availability of programs," followed by concern that "programs are too difficult for students" (Question 12b).

However, the problem area most teachers identified concerned the mechanics or operation of the computer. Seventy-eight percent of the respondents stated that they encountered recurring problems in this area (Question 12a). "Work interruptions often occur" and "logging on takes too long" were regarded as the number one and two problems respectively (Question 13b).

Twenty-seven percent of the respondents felt that there were problems with student learning as a result of the CAL Project (Question 14a). The major complaint was that "students miss too much class time while working on the computer" (Question 14b).

Effectiveness: Overall, 60% of the teachers felt the computer was "somewhat effective" as a teaching tool (Question 15). Thirty-two percent stated it was "very effective", while only 8% regarded it as "not effective". Teachers who had experienced some type of specialized training were more likely to believe it was "very effective" (Table IV-4). The majority of this group were resource teachers (Table IV-5). Approximately three quarters of the teachers without specialized training rated the computer as "somewhat effective" as a teaching tool (Table IV-4). This could indicate either a greater commitment and a more positive attitude on the part of teachers with

specialized training, or a better knowledge by these teachers of how to use the computer effectively.

General Comments: Comments from 25% of the teachers indicated a "need for more resources", such as an increase in the number and type of programs (Question 16). Seventeen percent of the respondents felt the "computer is a valuable asset for individualizing instruction". The importance of viewing the project as a "developing program" was also stated.

TABLE IV-4
PERCEIVED EFFECTIVENESS OF COMPUTER AS A TEACHING TOOL BY WHETHER TEACHER HAS HAD TRAINING IN COMPUTER ASSISTED LEARNING

Effectiveness of Computer As Teaching Tool	SPECIALIZED TRAINING	
	Have Had Training (N)	Have Not Had Training (N)
Not Effective	-	2
Somewhat Effective	3	12
Very Effective	6	2
Number of Respondents	9	16

TABLE IV-5
PERCEIVED EFFECTIVENESS OF COMPUTER AS A TEACHING TOOL BY TYPE OF TEACHER

Effectiveness of Computer As Teaching Tool	TYPE OF TEACHER			
	Classroom Teacher (N)	Resource Teacher (N)	Special Class Teacher (N)	Teacher Aide (N)
Not Effective	1	-	-	1
Somewhat Effective	9	2	3	1
Very Effective	2	6	-	-
Number of Respondents	12	8	3	2

(ii) Parent/Guardian Questionnaire

The parent questionnaire was designed to provide a general indication of parental awareness of and attitudes towards computer assisted learning.

Awareness: Overall, there appeared to be a high degree of parental awareness of Computer Assisted Learning Project. Eighty-four percent of the respondents knew their child worked with a computer at school (Question 1). Only 11% of these parents did not know how long their child had been working with the computer, while 22% stated they did not know any subjects in which their child used the computer (Question 2 and 3a respectively). Of the 364 subjects that parents listed, only ten were not CAL program subjects (Question 3b). This seems to confirm the apparent high degree of parental awareness.

Eighty-four percent of the parents indicated that their child first informed them of computer assisted learning (Question 4). This is consistent with the 84% of parents who stated they had heard their child talk about working with the computer (Question 5a). Of these parents, 95% believed that their child liked working with the computer (Question 5b). They perceived their child's attitude towards working with the computer as positive.

Impact of Computer Assisted Learning: Parents were asked whether their child's school work had improved and whether his/her attitude towards school has changed. Parents stated they saw a greater change in the area of their child's school work. Seventy percent indicated their child's school work had improved, while only 36% perceived a change in attitude (Question 6 and 7a respectively).

Of those parents who did witness an attitudinal change, only 1% saw this

change as being negative: eg. "child is too dependent on the computer/feels he/she no longer has to think" (Question 7b). The most frequent comment explaining students' attitudinal change was the "child is more willing to go to school/enjoys school more," (51%). Therefore, almost all the parents who noticed an altered attitude in their child, felt that the change was a positive one.

Effectiveness: When all parents were asked "Do you think students benefit from using a computer?", 56% replied "yes" (Question 8). A sizeable percentage responded that they did not know (41%). However, of the parents who knew their child was working with a computer, 59% felt it was beneficial, while 44% of parents who did not know their child worked with a computer, still saw it as beneficial (Table IV-6). As might be expected, parents who did not know whether their children used the computer, also stated they did not know whether it would be beneficial.

Very few parents explained why they did not think students would benefit (Question 8). However, one reason given was that the computer would be "used as an escape or toy for students". There was a greater response from parents who felt students did benefit from using a computer. The reasons given most frequently were: (1) "helps students to better understand subjects/improves their skills" (27%); (2) "increases student interest and enjoyment/motivating" (25%); and, (3) "it is important for today's technology" (18%) (Question 8c).

TABLE IV-6
PARENTS' AWARENESS OF WHETHER THEIR CHILD
WORKS WITH A COMPUTER BY PARENTS' PERCEPTIONS
AS TO WHETHER STUDENTS BENEFIT FROM USING A COMPUTER

	DO STUDENTS BENEFIT?			
Does Your Child Work With a Computer?	Don't Know (%)	No (%)	Yes (%)	Number of Respondents
Don't Know	81%	-	19%	21
No	48%	8%	44%	25
Yes	38%	3%	59%	291

IV. GENERAL OBSERVATIONS

1. During the 1979-80 school year the total cost of operating the Computer Assisted Learning Project equalled approximately $44,110. This included both costs paid by the schools and by the Province of Manitoba. For the 10 schools participating in 1979-80, the per school cost averaged about $4411. It is possible that an increase in the number of participating schools would reduce the per school cost, as Departmental and STEP student costs would be divided among a larger number of schools. This would occur only if Cybershare costs and STEP student costs paid by the Province of Manitoba do not increase. Therefore, if there is an increase in the number of schools connected on an interactive basis, an expansion of the Computer Assisted Learning Project to more schools may reduce total per school costs.

2. It appears that the majority of teachers involved with the Computer Assisted Learning Project felt the computer has some effectiveness as a teaching tool. The area in which the greatest amount of dissatisfaction was expressed was that of the mechanics or operation of the computer. Teachers also indicated a desire for a wider variety of programs. Such information may be of value to the continued development of the Computer Assisted Learning Project.

3. It appears that most teachers are familiar with computer assisted learning either as a result of working with the Project over time and/or as a result of receiving specialized training in the area. Although the majority of teachers were aware they receive assistance from University of Manitoba personnel, one-third stated they did not. As each school was assigned a Research Assistant, all teachers should be aware of the service if this support service is to be used effectively.

4. Overall, a positive relationship appears to exist between an increase in the amount of student contact time and teacher perceptions of effectiveness.

In schools where teachers were not satisfied with the amount of student contact time it appears that this perceived shortage of time did not result from a lack of hardware, but from other influencing factors present in the school situation.

5. Teachers most often used the computer to "drill students on skills already taught." Teachers also saw the individualizing of instruction as one of the most important aspects of the Computer Assisted Learning Project. Therefore, the main function of the CAL Project appears to be its ability to provide remedial drill to individual students. It serves a supplementary teaching function.

6. Parents exhibited a high degree of awareness of their child's experience with computer assisted learning. Possibly, this could be attributed to the students' willingness to talk about a new experience and/or a high degree of parental concern for the schooling of special needs children.

7. There seems to be a consensus between teachers and parents regarding the primary function of computer assisted learning. Although parents reported that their children liked working on the computer, parents saw the computer as a tool to help improve their child's school work, not as a method to motivate students.

SECTION V: ALTERNATIVES

I. INTRODUCTION

(A) Objective

The objective of this section is to identify and report on alternatives which can provide computer services to schools.

Specifically, the objectives were to:

- identify program alternatives in Manitoba and other jurisdictions;
- identify computer hardware alternatives in Manitoba and other jurisdictions; and,
- report on both hardware and program alternatives that were identified.

(B) Background

Prior to the establishment of the Network in 1973, a number of schools were offering Computer Science either as a course or as a section within the mathematics program. Currently, a number of schools in Manitoba which do not participate in the Network offer Computer Science and/or Data Processing courses. As well, one school, Pierre Radisson Collegiate, offers a vocational program in Business Education with Data Processing as a major.

Other jurisdictions in Canada and the United States have programs and/or hardware that are alternatives to those in existence in Manitoba.

II. METHODOLOGY

The identification of alternatives was carried out through a review of the literature, examination of trends, and visitations to in-province and out-of-province installations. Both hardware and program alternatives were examined. This identification was examined in terms of the future educational

and social needs of Manitoba's school system. In addition to this perspective, the identification of alternatives was examined in terms of technological advances, obsolescence of the existing configuration and equipment, trends and the current and anticipated relationship between technology and the role of education.

This approach enabled the study to address the three objectives simultaneously. Most importantly, this strategy served to provide insights and understanding for the overall findings of this study. The information gathered through this approach along with the results and findings of the preceding sections served as basis for conclusions/implications.

III. RESULTS AND DISCUSSION OF FINDINGS

(A) In-Province Alternatives

A variety of approaches (Table IIA-3), were used to support Computer Science and Data Processing instruction in Manitoba schools. Some of the non-Network approaches are discussed below.

(i) St. Paul's High School

St. Paul's High School processed student programs through an interactive terminal connected to the University of Manitoba. The University of Manitoba did not charge for computer useage. The rental and maintenance for the terminal was $1300. Under this arrangement the school was limited to the use of APL.

During the 1979-80 school year, 11 students were enrolled in Computer Science 205 and seven students were enrolled in Computer Science 305. The courses were taught as SIPS with each student being assessed an additional fee of $30.

As a replacement to the existing arrangement, St. Paul's is exploring the feasibility of purchasing a PDP-1103 mini-computer with four terminals costing approximately $20,000.

(ii) Dakota Collegiate

The Computer Science program at this school was supported by a single micro computer. This arrangement served 76 students in the 1979-80 school year. The one-time purchase cost of the equipment was estimated at $2000. If it is assumed that the equipment lasts three years then the annual cost per student over this period would be less than $9 per year per student enrolled.

(iii) Joseph Wolinsky High School

Computer Science at this school was supported by an Alpha-Microcomputer System with 96K storage, 4 terminals and a printer. In addition, the equipment was used to provide support to other courses and performed administrative functions. The one-time purchase price of the equipment was approximately $18,000.

(iv) Lord Selkirk Regional Secondary School

Instructional and administrative services were provided at Lord Selkirk Regional Secondary School using an in-house system with 196K plus disc drive, printers and terminals. Previously, the Division had participated in the Network. The one-time purchase price was $70,000 financed over a seven year period. Maintenance was an additional $7,000 per annum. The Division estimated their annual cost to be equivalent to that of Network participation. No subsidy or support was received from the Department of Education.

(v) Opasquia Elementary School

During the 1979-80 school year Opasquia Elementary School participated in the Computer Assisted Learning Project. The school used a TRS-80 micro computer for computer assisted instruction. CAL programs normally accessed through interactive terminals have been made available for use on micro computers. This alternative allows schools which would otherwise be prevented from joining the CAL Project because of high line charges, access to the CAL Project.

(vi) Phoenix School

Phoenix School will be implementing a computer assisted instruction program in conjunction with Project IDA. This represents a new alternative in the delivery of computer assisted learning programs.

(vii) Pierre Radisson Collegiate

Pierre Radisson Collegiate had both program and hardware alternatives in place during the 1979-80 school year. The hardware alternative consisted of processing student programs on 10 PET micro computers for students in a Data Processing major. The Data Processing major was the program alternative that the school had developed in conjunction with the Business Education Consultant from the Department of Education and an advisory committee. The program entailed 50% of the students' time being involved in job-related training. It is expected that the students will graduate with job entry level skills.

In addition, the school participates in the Network and offers Computer Science 205 and 305.

Tables V-1 and V-2 provide an overview of the existing and intended uses of micro and mini computers in Manitoba schools.

B. Out-Of-Province Alternatives

(i) Dallas Public Schools

In the spring of 1977-78 Dallas began the systematic adaptation of its Mathematics Curriculum for grades K-8 for use on micro computers. The rationale for this decision was to support the teaching of mathematics through individualization and drill and practice. In the District's opinion this was the most effective method of teaching mathematics.

TABLE V-1
USES OF MICROS/MINIS BY SCHOOLS
PRESENTLY OWNING AT LEAST ONE

Type of School / School	Uses									
	TEST SCORING	BUDGET-FINANCIAL REPORTING	ATTENDANCE	COMPUTER ASSISTED LEARNING	COMPUTER SCIENCE COURSES	DATA PROCESSING	COMPUTER LITERACY COURSES	INSTRUCTIONAL SUPPORT	PHYSICAL AND MENTALLY HANDICAPPED	CHOICES
Network schools										
Churchill High				*	*		*			
Garden City	*			*	*	*		*		
Goose Lake High								*		
Grant Park High				*	*				*	
Kelvin High	*	*		*	*		*			
Kildonan East Regional		*								
Pierre Radisson Comp.						*				
Transcona Collegiate			*	*	*	*	*			
West Kildonan				*	*	*	*			
Non-Network Schools										
Portage la Prairie Regional				*	*		*			
Lord Selkirk	*	*			*	*	*			
Dakota Collegiate					*	*				

TABLE V-2

INTENDED USES OF MICROS/MINIS BY
SCHOOLS PLANNING ON PURCHASING AT LEAST ONE

Type of School / School	Uses									
	TEST SCORING	BUDGET-FINANCIAL REPORTING	ATTENDANCE	COMPUTER ASSISTED LEARNING	COMPUTER SCIENCE COURSES	DATA PROCESSING	COMPUTER LITERACY COURSES	INSTRUCTIONAL SUPPORT	PHYSICAL AND MENTALLY HANDICAPPED	CHOICES
Network schools										
Crocus Plains Regional				*	*	*	*			
Dauphin Regional Sec.			*	*	*	*	*			
Elmwood High	*			*	*	*	*			
Fort Richmond			*	*	*	*	*			
Garden Valley					*	*				
Glenlawn	*	*	*	*	*	*	*			
John Taylor					*	*				
Kelvin High	*	*		*	*		*			
Margaret Barbour				*	*	*	*	*		
Murdoch Mackay				*	*	*	*			
Neelin High				*	*	*	*			
Neepawa Area Collegiate										
R. D. Parker					*	*	*			
Sisler High	*	*	*	*	*	*	*			
St. John's High	*		*	*						
Steinbach Regional Sec.	*	*	*	*			*			*
Vincent Massey	*	*	*	*	*					
Non-Network Schools										
Gilbert Plains				*	*	*				
Grandview										

The hardware in use was a Radio Shack TRS-80 micro computer with Level II Basic and 16K memory.

(ii) Denver Public Schools

In 1970 Denver Public Schools installed a large scale Univac 1100 series system with ability to handle instructional time-sharing. This system supported vocational training in one school and supported other subjects in nine high schools. In 1979 the District added 29 micro computers to the system.

This combined system was used for instructional use, computer managed instruction use, computer assisted instruction and administrative processing.

(iii) Minnesota Educational Computing Consortium (MECC)

MECC operated a large Cyber 73 mainframe combined with smaller units to provide state-wide support to 2,000 interactive and batch terminals. In addition, MECC distributed and supported a Network of APPLE II micro computers.

MECC supplied support to all subjects taught in Minnesota schools in grades K-12, as well as vocational Computer Science/Data Processing programs. The system was integrated with the total educational computer services from kindergarten through university. A program library of over 950 computer programs supplemented curricula at the elementary, secondary and college levels.

Software was developed and is being maintained to support the school district management, Data Processing and reporting needs in areas of personnel, finance, student and instructional management.

Approximately $30 million was spent on educational computing in Minnesota. The MECC budget was $6 million and $24 million was spent by universities, colleges and school districts.

IV. GENERAL OBSERVATIONS

1. At St. Paul's High School there did not appear to be any problems with the student/terminal ratio of 18:1. However, no other uses were made of the terminal.

2. At Lord Selkirk Regional Secondary School, much of the success of the venture may be dependent on the commitment and expertise of the program co-ordinator.

3. A number of U.S. alternatives originated as mainframe time-sharing systems. The trend has been towards stand-alone micro computers to supplement or replace existing systems. The primary motivation for this move toward micro computers has been the costs of communications associated with time-sharing systems.

APPENDIX A

PRINCIPAL QUESTIONNAIRE

For Office Use Only
☐☐1 1-3
☐☐☐☐ 4-7

1. (a) Does your school participate in the Manitoba High Schools Computer Network? (Please check (✓) one box only)

No ☐1
Yes ☐2] 8

(b) Are you aware of the administrative services available on the network? (Please check (✓) one box only)

No ☐1
Yes ☐2] 9

2. Does your school use a computer or data processing service to perform any administrative functions:

No ☐1 ⟶ Go to Question 4] 10
Yes ☐2

(a) Student scheduling

No ☐1
Yes ☐2] 11

Supplier

Manitoba High School Computer Network ☐1] 12
Other (specify) _____ ☐
Cost per year $☐☐☐☐.00 13-16

(b) Grade reporting

No ☐1
Yes ☐2] 17

Supplier

Manitoba High School Computer Network ☐1] 18
Other (specify) _____ ☐
Cost per year $☐☐☐☐.00 19-22

(c) Cumulative Student Records

No ☐1
Yes ☐2] 23

Supplier

Manitoba High School Computer Network ☐1] 24
Other (specify) _____ ☐
Cost per year $☐☐☐☐.00 25-28

2.(d) Test Scoring

No ☐1
Yes ☐2] 29

Supplier

Manitoba High School Computer Network ☐1] 30
Other (specify) _____ ☐] 31-34
Cost per year $☐☐☐☐.00

3. Have you ever used alternative methods for performing any of the above listed administrative functions?

No ☐1 ⟶ Go to Question 4] 35
Yes ☐2
↓
Which function: _____ ☐ 36
Please name most recent: _____ ☐ 37
Reason(s) for change: _____ ☐ 38
_____

Office Use Only

4. Are there other Administrative/Instructional Services that you would like to see provided by computer for your school?

No ☐1 ⟶ Go to Question 5] 39
Yes ☐2

Please place a check (✓) in the boxes beside those services below and indicate the amount of money per year you would be willing to spend for them.

(a) Budget/financial statement ☐1 $☐☐☐☐.00 40 41-44
(b) Attendance recording/reporting ☐1 $☐☐☐☐.00 45 46-49
(c) Vocational-Industrial/Business Education grant reporting ☐1 $☐☐☐☐.00 50 51-54
(d) Computer assisted learning ☐1 $☐☐☐☐.00 55 56-59
(e) Other (specify) _____ ☐ $☐☐☐☐.00 60 61-64
(f) Other (specify) _____ ☐ $☐☐☐☐.00 65 66-69

5. Complete this question ONLY if you use the Administrative Services available through the High School Computer Network, otherwise go to question 6.

	Very Satisfactory	Satisfactory	Not Satisfactory	
(a) For each of the three areas of service offered, and actually used by you, how well is the administrative package serving your purposes?				
Student Scheduling	☐1	☐2	☐3	70
Grade Reporting	☐1	☐2	☐3	71
Cumulative Records	☐1	☐2	☐3	72

(b) For those services NOT SATISFACTORY briefly describe the specific areas _____ Office Use Only ☐☐ 73-74

Office use only

☐☐[2] 1-3

5.(c) Please enter the estimated annual number of hours expended by the following personnel on the services used:

Principal	☐☐☐☐ hours	4-7
Other administrative staff	☐☐☐☐ hours	8-11
School clerical staff	☐☐☐☐ hours	12-15
Teachers in the school	☐☐☐☐ hours	16-19

(d) What are your approximate annual direct costs (i.e. money paid out), for using:

Keypunch services	$☐☐☐☐.00	20-23
Computer hardware rental	$☐☐☐☐.00	24-27
Computer time used	$☐☐☐☐.00	28-31
Supplies (cards, etc.)	$☐☐☐☐.00	32-35
Other related costs Specify: _____ ☐ 36	$☐☐☐☐.00	37-40

(e) Please check (✓) all reasons why you are using the Administrative Package of the High School Computer Network over other possible suppliers

More economical ☐1 41

Easier to use ☐1 42

More flexible ☐1 43

Better suited to my needs ☐1 44

Locally operated ☐1 45

Other (specify) _____ ☐ 46

_____ ☐ 47

(f) Do you find the manuals available to guide you in the use of the Administrative Package helpful?

No ☐1 → Why not? Specify _____ ☐ 49

48

_____

Yes ☐2

6. Please check (✓) ALL the reasons why you do not use the [illegible]

Too expensive ☐ 1 50

Too complicated to use ☐ 1 51

Do not have staff resources to run the package ☐ 1 52

Not flexible enough ☐ 1 53

Enrolment not large enough ☐ 1 54

Other (specify) _____ ☐ 55

_____

7. (a) Does your school own or lease a micro or mini computer(s)?

No ☐ 1 → 56

Yes ☐ 2 ↓

Do you plan to acquire one within 18 months?

No ☐ 1 → Go to Question 8

Yes ☐ 2 → Continue with Question 7(b) 57

(b) What uses do you now make or plan to make of the micro or mini computer? (Check (✓) all that apply)

Scheduling ☐ 1 58

Grade reporting ☐ 1 59

Student records ☐ 1 60

Test scoring ☐ 1 61

Budget/financial reporting ☐ 1 62

Attendance ☐ 1 63

Computer assisted learning ☐ 1 64

Computer science courses ☐ 1 65

Data processing courses ☐ 1 66

Computer literacy courses ☐ 1 67

Other (specify) _____ ☐ 68

Other (specify) _____ ☐ 69

8. Does your school have key punch machines?

No ☐ 1 → Go to Question 9 70

Yes ☐ 2

71-72

Number of key punches ☐☐

These machines are: Leased ☐ 1

Owned ☐ 2 73

Cost per year (if owned show cost of maintenace/if leased show lease costs) $☐☐☐☐.00 74-77

Office Use Only ☐☐3 1-3

9. Does your school have any interactive terminals/teletypes?

No ☐ 1 → Go to Question 10 4

Yes ☐ 2

Make and Model _____ ☐ 5

Connected to: University of Manitoba ☐ 1

Cybershare ☐ 2

Other (specify) _____ ☐ 6

Annual cost $☐☐☐☐.00 7-10

10. What is the value of supplies and materials that your school has budgeted for this year? (Do not indlude textbooks).

(a) Value of supplies and materials for administrative use of the computer $☐☐☐☐.00 11-14

(b) Value of supplies and materials for total instructional uses of the computer $☐☐☐☐.00 15-18

11. How are computer science and data processing student jobs processed in your school? (Please check (✓) all those that apply).

On terminal in my school connected to the Manitoba High School Computer Network ☐1 19

On terminal in another school connected to the Manitoba High School Computer Network ☐1 20 Cost Per Year $☐☐☐☐.00 21-24

On micro or mini computer in my school ☐1 25 Cost Per Year $☐☐☐☐.00 26-29

On terminal in my school connected to University of Manitoba computer ☐1 30 Cost Per Year $☐☐☐☐.00 31-34

By mail or courier to the Department of Education ☐1 35 Cost Per Year $☐☐☐☐.00 36-39

By mail or courier to the University of Manitoba computer ☐1 40 Cost Per Year $☐☐☐☐.00 41-44

Other (specify) _____ ☐ 45 Cost Per Year $☐☐☐☐.00 46-49

12. Do you have any computer related courses other than Computer Science 205 and 305 and Data Processing 202 and 302 courses, (including SICS and SIPS) available in your school?

No ☐1 ⟶ Go to 13
Yes ☐2
] 50

Please list the Courses:	Enrolment	Credit Value

13. Do you have any plans to change or enhance your computer related equipment or services in the next 18 months?

No ☐1
Yes ☐2] 51
↓
Describe:

_____
_____ ☐] 52
_____

THANK YOU FOR YOUR HELP

PLEASE RETURN IN THE ENVELOPE PROVIDED FOR THAT PURPOSE

APPENDIX B

COMPUTER SCIENCE/DATA PROCESSING TEACHER QUESTIONNAIRE

For Office Use Only
☐☐ 1-2
☐[1] 3-4

1. For each of the following courses please indicate the percent of time you devote to each of the computer languages. The time should total to 100%.

COMPUTER SCIENCE

	205		305	
Basic	☐☐☐	5-7	☐☐☐	27-29
Cobol	☐☐☐	8-10	☐☐☐	30-32
Fortran	☐☐☐	11-13	☐☐☐	33-35
Assembler	☐☐☐	14-16	☐☐☐	36-38
Spectre	☐☐☐	17-19	☐☐☐	39-41
Cardiac	☐☐☐	20-22	☐☐☐	42-44
Other Specify _____	☐☐☐	23-25	☐☐☐	45-47
	☐ 26	100%	☐ 48	100%

☐[2] 4

DATA PROCESSING

	205		305	
Basic	☐☐☐	49-51	☐☐☐	5-7
Cobol	☐☐☐	52-54	☐☐☐	8-10
Fortran	☐☐☐	55-57	☐☐☐	11-13
Assembler	☐☐☐	58-60	☐☐☐	14-16
Spectre	☐☐☐	61-63	☐☐☐	17-19
Cardiac	☐☐☐	64-66	☐☐☐	20-22
Other Specify _____	☐☐☐	67-69	☐☐☐	23-25
	☐ 70	100%	☐ 26	100%

2. Have you been asked by other teachers or administrators in your school to help them make use of the computer (terminal, PLUM, etc.)?

No ☐ 1
Yes ☐ 2 → 27

Average number of minutes per week ☐☐☐ 28-30

3. Place a check (✓) in the box that best represents your level of satisfaction with the following:

	Not Applicable	Very Dissatisfied	Somewhat Dissatisfied	Somewhat Satisfied	Very Satisfied	
1. The terminal (card reader/printer) in the school	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	31
2. The terminal (interactive/teletype) in the school	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	32
3. The software available to process the student jobs	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	33
4. The turn around time (amount of time it takes to process a student job)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	34
5. The cost of the service	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	35
6. The support needed from the computer services Branch, Department of Education	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	36
7. The support received from Cybershare	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	37
8. The speed at which I receive service from the Manitoba Telephone System	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	38
9. The quality of service I receive from the Manitoba Telephone System	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	39
10. The suitability of the Manitoba High School Computer Network to my needs	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	40
11. Other specify _____ ☐ 41	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	42

4. How are computer science and data processing student jobs processed in your school? (Please check (✓) all those that apply)

On terminal in my school connected to the Manitoba High School Computer Network ☐ 1 43

On terminal in another school connected to the Manitoba High School Computer Network ☐ 1 44

On mini or micro computer in my school ☐ 1 45

On terminal in my school connected to University of Manitoba Computer ☐ 1 46

By mail or courier to the Department of Education ☐ 1 47

By mail or courier to the University of Manitoba Computer ☐ 1 48

Other (specify) _____ ☐ 49

5. Have you ever used something other than that which you are now using to process student jobs?

No ☐ 1

Yes ☐ 2 ⟶ What was the alternative] 50

_____ ☐☐ 51-52

_____

Why did you change

_____ ☐☐ 53-54

_____

6. Comments

_____

_____

_____

_____

THANK YOU FOR YOUR HELP

PLEASE RETURN IN THE ENVELOPE PROVIDED FOR THAT PURPOSE

COMPUTER SCIENCE/DATA PROCESSING FOLLOW-UP SURVEY

For Office Use Only

☐☐☐☐-☐☐☐-☐ 1-8

TO ANSWER THESE QUESTIONS PLEASE CHECK THE APPROPRIATE CHOICE OR FILL IN THE BLANKS

---

1. When did you graduate from high school?

   19___? ☐☐ 9-10

2. Sex: 11 ☐ Male (1) ☐ Female (2)

3. What was your overall academic average in your last year of high school?

   12 ☐ A+ = 90-100% (1)
   ☐ A = 80-89 (2)
   ☐ B = 70-79 (3)
   ☐ C = 56-69 (4)
   ☐ D = 50-55 (5)
   ☐ E = less than 50% (6)

4. Which of the following courses have you taken?

   13 ☐ Computer Science 205 (1)
   14 ☐ Computer Science 305 (1)

   If you took Computer Science 205 but not 305, could you indicate why? _____

   _____

   _____

   15 ☐ Data Processing 202 (1)
   16 ☐ Data Processing 302 (1)

   If you took Data Processing 202 but not 302, could you indicate why? _____

   _____ ☐☐ 17-18

   _____

   Did you take any other Computer Science or Data Processing courses in high school?

   19 ☐ Yes (1) ☐ No (2)

   If "yes" please specify course(s), eg. Computer Science 105. ☐ 20

   _____

5. Have you enrolled in school or taken any further training (eg. apprenticeship, community college, university, private business school, etc.) since leaving high school?

   21 ☐ Yes (1) ☐ No (Skip to Question 8) (2)

6. Please indicate in the spaces provided the names of the schools attended after high school and your program of study.

Institution Name	Program(s) of Study	
(1) _____	(1) _____	☐☐☐ 22-24
_____	_____	
(2) _____	(2) _____	☐☐☐ 25-27
_____	_____	

7. Did you take any computer science or data processing courses in your program of study after high school?

28 ☐ 1 Yes ☐ 2 No (Go to question #8)

How well did your high school computer science/data processing course prepare you for this program of study?

29 ☐ 1 Not at all ☐ 2 To some extent ☐ 3 To a great extent

Did you receive any university, community college credit for the computer science or data processing courses you took in high school?

30 ☐ 1 Yes ☐ 2 No

8. Please place a check beside the main activity in which you are presently engaged (i.e. unemployed, employed, etc.).

Your present main activity is:

31 ☐ 1 Employed (Go to question #9)
☐ 2 Unemployed and looking for work
☐ 3 In school or taking further training
☐ 4 Keeping house full-time
☐ 5 Other (specify) _____

Go to question #11

9. What is your present occupation? (Please use at least two words to describe your job. eg. "restaurant manager" not "manager").

_____ ☐☐☐☐ 32-35
_____

10. Is your present occupation related to your computer science or data processing course?

36 ☐ 1 Yes ☐ 2 No (Go to question #11)

If "yes" what languages are you using. Please check (✓) all that apply and the percentage of time the language is used on the job.

	Language	% Time Language Is Used	
37 ☐ 1	Basic	_____	☐☐ 42-43
38 ☐ 1	Cobol	_____	☐☐ 44-45
39 ☐ 1	Fortran	_____	☐☐ 46-47
40 ☐ 1	Assembler	_____	☐☐ 48-49
41 ☐ 1	Other (specify) _____	_____	☐☐ 50-51
	TOTAL	100%	

11. What language(s) did you take in your high school computer science/data processing course? Please check (✓) all that apply and the % of course time spent on each language.

	Language	% Time	
52 ☐ 1	Basic	____	58-59
53 ☐ 1	Cobol	____	60-61
54 ☐ 1	Fortan	____	62-63
55 ☐ 1	Assembler	____	64-65
56 ☐ 1	Spectre	____	66-67
57 ☐ 1	Other (specify) _____	____	68-69
	TOTAL	100%	

12. Please check the degree to which you were satisfied with the following aspects and services of your computer science or data processing course?

		Very Dissatisfied	Dissatisfied	Undecided	Satisfied	Very Satisfied
(a)	Overall quality of instruction	70 ☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
(b)	Instructor interest in students	71 ☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
(c)	Instructor availability after class	72 ☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
(d)	Availability of equipment	73 ☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
(e)	Reliability of equipment	74 ☐ 1	☐ 2	☐ 3	4	5
(f)	Time required to receive job after submission	75 ☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
(g)	The equipment used in the course	76 ☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

13. Would you choose computer science or data processing as a high school course option again?

77 ☐ 1 Yes ☐ 2 No

Why not? (specify) _____

_____ 78 ☐

_____

THANK YOU FOR YOUR HELP

Please return completed questionnaire in attached envelope

APPENDIX C

For Office Use Only

PROGRAM LIBRARY USERS MANUAL (PLUM)

☐☐☐☐ 1-4

This questionnaire is an attempt to gather information on the Manitoba High School Computer Network, specifically Program Library Users Manual (PLUM).

Please react to the following questions based on your experience during the 1979/80 school year teaching

---

1. Do you know where the computer equipment is located in this school? (Check (✓) one only)

   No ☐ 1
   Yes ☐ 2 -5

2. Are you aware of the Program Library Users Manual (PLUM) programs available through the High School Computer Network? (Check (✓) one only)

   No ☐ 1 ⇨ Go to Question 15 -6
   Yes ☐ 2

3. How did you find out about PLUM? (Check (✓) one only)

   MAN-ADS Newsletter ☐ 1
   Inservices/conferences ☐ 2
   Computer science/business education teacher ☐ 3
   Student in school ☐ 4
   Department of Education personnel ☐ 5
   Teacher in your school ☐ 6
   Other (specify) _____ ☐
   _____ -7

4. Have you ever used a PLUM Program?

   No ☐ 1 ⇨ Go to Question 10 -8
   Yes ☐ 2 ⇨ Which ones (please name) _____ -9-10
   _____ ☐
   ☐

5. Did you use PLUM for: (Check (✓) all that are appropriate)

   Marking purposes ☐ 1 -11
   Instructional purposes ☐ 1 -12

6. Why did you use PLUM for instructional purposes? (Check (✓) all that apply)

   I did not use PLUM for instructional purposes ☐ 1 -13
   To provide content not otherwise available ☐ 1 -14
   To motivate students ☐ 1 -15
   To increase student understanding of course concepts/content ☐ 1 -16
   To provide opportunity to use different teaching techniques ☐ 1 -17
   Other (specify) _____ ☐ -18
   _____

7. How well did PLUM serve the purpose for which you intended it? (Check (✓) one only)

   Not well at all ☐ 1
   Not well ☐ 2
   Moderately well ☐ 3
   Very well ☐ 4 -19

8. Who usually runs the PLUM programs you use? (Check (✓) one only)

- Yourself ☐ 1
- Computer science/business education student ☐ 2
- Computer science/business education teacher ☐ 3
- Resource person ☐ 4
- Other school personnel ☐ 5
- Other (specify) _____ ☐ _____

-20

9. Would you use PLUM again in the future? (Check (✓) one only)

21 —
- No ☐ 1 ⇨ Why not? Specify _____ _____ _____ Go to Question 11 ☐ -22
- Yes ☐ 2 ⇨ Go to Question 11

10. Please check all the reasons for your not using PLUM. (Check (✓) all appropriate answers)

- Requires too much preparation time ☐ 1 -23
- Too complicated to use ☐ 1 -24
- Does not fit into my program ☐ 1 -25
- I do not think my classes benefit from it ☐ 1 -26
- Does not adequately explain concepts/content ☐ 1 -27
- Do not know how to use computer ☐ 1 -28
- PLUM was never explained to me ☐ 1 -29
- Time restrictions of course do not allow implementation of PLUM ☐ 1 -30
- Heavy usage of terminal prohibits easy access for my purposes ☐ 1 -31
- Other (specify) _____ _____ ☐ -32

11. Did you find the instructions on how to use PLUM easy to understand? (Check (✓) one only)

- No, they are difficult to understand ☐ 1
- Yes, they are easy to understand ☐ 2
- I do not know/I have never used PLUM ☐ 3

-33

12. Do you think PLUM should be continued to be offered in its present form?

34 —
- No ☐ 1 ⇨ Why not (specify) _____ _____ ☐ -35
- Yes ☐ 2

13. Would you recommend PLUM to your colleagues? (Check (✓) one only)

36 —
- No ☐ 1 ⇨ Why not (specify) _____ _____ ☐ -37
- Yes ☐ 2

14. Are there changes you would like to see made to PLUM as it now exists? (Check (✓) one only)

38 —
- No ☐ 1
- Yes ☐ 2 ⇨ Specify _____ _____ _____ ☐ -39

15. Do you know whom you contact to get information about PLUM:

	In this School	At the Department of Education
No	☐ 1	☐ 1
Yes	☐ 2	☐ 2
	-40	-41

THANK YOU FOR YOUR HELP

PLEASE RETURN COMPLETED QUESTIONNAIRE IN ATTACHED ENVELOPE

APPENDIX D

COMPUTER ASSISTED LEARNING (CAL) PROJECT 1979-80

This questionnaire is intended to gather information on the Manitoba High School Computer Network, specifically the Computer Assisted Learning (CAL) Project for Special Needs Children and Adolescents.

OFFICE USE ONLY
☐☐☐ 1-3
☐☐☐ 4-6

1. What is your position in this school? (Please check (✓) one box only).

Classroom teacher ☐ 1
Resource teacher ☐ 2
Special class teacher ☐ 3
Teacher aide ☐ 4
Other (please specify _____
_____) ☐ -7

2. How long have you been involved with the Computer Assisted Learning Project? (Please check (✓) one box only).

Less than one year ☐ 1
More than one year but less than two years ☐ 2
Two years or more ☐ 3 -8

3. This question concerns specialized training you may have had in computer assisted learning. Please place a check (✓) beside all the options which describe the specialized training you have had.

I have not had any specialized training in computer assisted learning ☐ 1 -9

University of Manitoba (Faculty of Education) CAL course(s) ☐ 1 -10

University of Manitoba (Faculty of Education) CAL thesis ☐ 1 -11

CAL course(s) from another University ☐ 1 -12

CAL thesis from another University ☐ 1 -13

CAL inservices ☐ 1 -14

Other (please specify _____
_____) ☐ -15

4. a) Do you receive assistance from any University of Manitoba personnel (i.e. Research Assistant(s), CAL Supervisor, CAL Project Co-ordinator)? (Please check (✓) one box only).

No ☐ 1
Yes ☐ 2 ⇨ Go to Question 5 -16

b) How satisfied are you with the assistance you receive? (Please check (✓) one box only).

Very dissatisfied ☐ 1
Dissatisfied ☐ 2
Somewhat satisfied ☐ 3
Satisfied ☐ 4
Very Satisfied ☐ 5 -17

5. During the last 5 day calendar week, on average, how many times and minutes per time did each of your students use the computer? Please place answers in the spaces provided.

EXAMPLE: On average, if each student used the computer 3 times last week, for approximately 20 minutes per time, you would put:

Times Per Last 5 Day Calendar Week	Average Minutes Per Time
0 3 times per week	2 0 average minutes per time

Times Per Last 5 Day Calendar Week	Average Minutes Per Time
___ ___ times per week -18 -19	___ ___ average minutes per time -20 -21

6. a) Do you feel that on average, the number of times and minutes per time that each student uses the computer per 5 day calendar week allows the student to work effectively with the computer? (Please check (✓) one box only).

No ☐ 1
Yes ☐ 2 ⇨ Go to Question 7 -22

b) On average, during a 5 day calendar week, how many times and minutes per time do you feel each student needs in order to work effectively with the computer? Please place answers in the spaces provided.

Times Per 5 Day Day Calendar Week	Average Minutes Per Time
___ ___ times per week -23 -24	___ ___ average minutes per time -25 -26

7. Who selects the students who participate in the Computer Assisted Learning Project? (Please check (✓) all that apply).

Principal ☐ 1 -27

Classroom teacher ☐ 1 -28

Resource teacher ☐ 1 -29

Special class teacher ☐ 1 -30

Other (please specify _____

_____) ☐ -31

8. How are students selected to participate in the Computer Assisted Learning Project? (Please check (✓) all that apply).

Standardized tests ☐ 1 -32

School-developed tests ☐ 1 -33

Classroom teacher's recommendation ☐ 1 -34

Resource teacher's recommendation ☐ 1 -35

Special class teacher's recommendation ☐ 1 -36

Request by parent(s) ☐ 1 -37

Other (please specify _____

_____) ☐ -38

9. Primarily, do you use the computer to: (Please check (✓) one box only).

Drill students on skills already taught ☐ 1

Teach new skills ☐ 2

Increase student motivation ☐ 3

Other (please specify _____

_____) ☐ -39

10. Please place a check (✓) beside the three (3) aspects of the Computer Assisted Learning Project which you feel are most important.

Provides individualized instruction ☐ 1 -40

Increases student motivation ☐ 1 -41

Saves teacher time ☐ 1 -42

Increases student learning/retention ☐ 1 -43

Provides immediate feedback to student ☐ 1 -44

Provides a flexible form of instruction ☐ 1 -45

Promotes a positive change in students' attitudes towards school ☐ 1 -46

Provides supplementary remediation ☐ 1 -47

Increases students' computer literacy ☐ 1 -48

Other (please specify _____

_____) ☐ -49

11. What types of CAL programs do your students use? (Please check (✓) all that apply).

Mathematics ☐ 1 -50

Language Arts ☐ 1 -51

French ☐ 1 -52

Science ☐ 1 -53

Games ☐ 1 -54

Basic Life Skills (eg. money skills, bus routes) ☐ 1 -55

Other (please specify _____) ☐ -56

_____

12. a) This question concerns the CAL programs your students use. Do you encounter any problems with the CAL programs your students use?

No ☐ 1 ⇨ Go to Question 13 -57

Yes ☐ 2

b) Please place a check (✓) beside all the problems which you encounter with the CAL programs.

Students do not learn relevant skills/ concepts from CAL programs ☐ 1 -58

Content is not related to the curriculum ☐ 1 -59

Programs are too difficult for the students ☐ 1 -60

Programs are too easy for the students ☐ 1 -61

Sequence and pace of programs are not geared to students' abilities ☐ 1 -62

Other (please specify _____) ☐ -63

_____

13. a) This question concerns the mechanics and operation of the computer. Do you encounter any recurring problems with the mechanics or operation of the computer? (Please check (✓) one box only).

No ☐ 1 ⇨ Go to Question 14 -64

Yes ☐ 2

b) Please place a check (✓) beside all the problems which you encounter with the mechanics and operation of the computer.

Logging on takes too long ☐ 1 -65

Equipment is too noisy ☐ 1 -66

Accessing programs is difficult ☐ 1 -67

Equipment cannot be moved ☐ 1 -68

Work interruptions often occur ☐ 1 -69

Students have difficulty with the mechanical operations required ☐ 1 -70

Cannot correct errors by backspacing ☐ 1 -71

Other (please specify _____) ☐ -72

_____

14. a) This question concerns <u>student learning</u>. Do you encounter any problems with student learning as a result of the Computer Assisted Learning Project? (Please check (✓) <u>one</u> box only).

No ☐ 1 ⇨ Go to Question 15 -73

Yes ☐ 2

b) Please place a check (✓) beside <u>all</u> the problems which you encounter with student learning as a result of the Computer Assisted Learning Project.

Students miss too much class time while working on the computer ☐ 1 -74

Decreases student learning/retention ☐ 1 -75

Location of the computer distracts other students ☐ 1 -76

Other (please specify _____) ☐ -77

15. Overall, how effective do you think the computer is as a teaching tool? (Please check (✓) <u>one</u> box only).

Not effective ☐ 1

Somewhat effective ☐ 2 -78

Very effective ☐ 3

16. If you have any further comments regarding computer assisted learning or the Computer Assisted Learning Project please enter them in the space below.

_____

_____

_____

_____

_____

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THANK YOU FOR YOUR HELP.

Please return the completed questionnaire in the attached envelope.

COMPUTER ASSISTED LEARNING IN MANITOBA SCHOOLS 1979 - 80

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☐☐☐ 1-3

☐☐☐ 4-6

All questions refer to:

_____

1. Does your child work with a computer at school? (Please check (✓) one box only).

   Don't know ☐ 1 ⇨ go to Question 8

   No ☐ 2 ⇨ go to Question 8

   Yes ☐ 3

   -7

2. How long has your child been working with the computer at school? (Please check (✓) one box only).

   Don't know ☐ 1

   Less than a month ☐ 2

   One to six months ☐ 3

   Seven months to one year ☐ 4

   More than one year ☐ 5

   -8

3.a) Do you know in which subjects your child uses the computer? (Please check (✓) one box only).

   No ☐ 1 ⇨ go to Question 4

   Yes ☐ 2

   -9

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☐☐☐ 10-12

☐☐☐ 13-15

b) Please name the subjects.

subject: _____ subject: _____

subject: _____ subject: _____

subject: _____ subject: _____

4. Who first told you that your child was working with the computer at school? (Please check (✓) one box only).

   Your child ☐ 1

   A classroom teacher ☐ 2

   A resource teacher ☐ 3

   Principal ☐ 4

   Other (Who? _____ ☐

   _____)

   -16

5.a) Have you heard your child talk about working with the computer? (Please check (✓) one box only).

No, I have not ☐ 1 ⇨ go to Question 6 -17

Yes, I have ☐ 2

b) Overall, what is your child's attitude towards working with the computer? (Please check (✓) one box only).

Likes working with the computer ☐ 1 -18

Dislikes working with the computer ☐ 2

6. This question deals with your child's school work. Do you think your child's school work has improved since he/she began working with the computer? (Please check (✓) one box only).

No, it has not improved ☐ 1 -19

Yes, it has improved ☐ 2

7.a) This question deals with your child's attitude towards school. Do you think your child's attitude towards school has changed since he/she began working with the computer? (Please check (✓) one box only).

No, his/her attitude has not changed ☐ 1 ⇨ go to Question 8 -20

Yes, his/her attitude has changed ☐ 2

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☐☐ 21-22

☐☐ 23-24

b) In what way(s) has his/her attitude changed?

_____

_____

_____ _____

8.a) Do you think that students benefit from using a computer? (Please check (✓) one box only).

I don't know ☐ 1

No, they do not benefit ☐ 2 ⇩

Why not? _____

_____

_____

Yes, they do benefit ☐ 3 -25 ⇩

In what ways? _____

_____

_____

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☐☐ 28-29

THANK YOU FOR YOUR HELP.

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